Pit and Quarry

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Producing *better* machines than the buyer knows he wants

Before the buyers of shovels and cranes knew that these machines could be driven by any power but steam or electricity—BUCYRUS-ERIE built *the first gasoline excavator,* in 1912.

At a time when shovel users had no idea of a direct-drive electric machine that could compete with steam— BUCYRUS-ERIE built *the first 3-motor electric shovel.*

While traction wheel and railroad type mountings were still looked on as satisfactory, BUCYRUS-ERIE produced *the first shovel on caterpillar type mounting,* in 1912.

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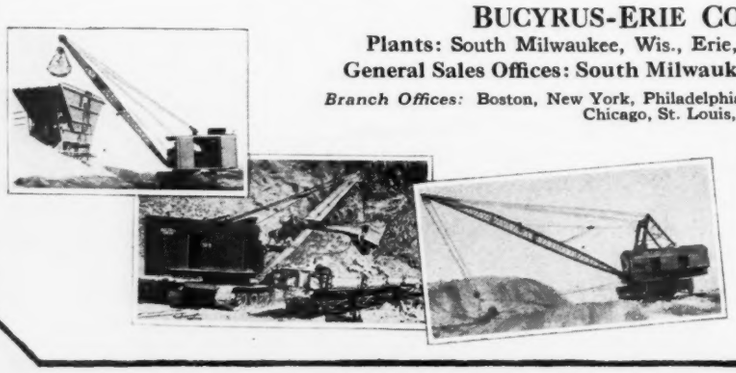

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AN ANALYSIS OF HIGHWAY ACCIDENTS

By Charles M. Upham

THE daily cost of highway accidents in this country is 2,261 persons killed or injured, and an economic loss of nearly $2,000,000. During the year 1927, highway accidents exacted a total of 26,618 lives, 798,700 persons seriously injured, an economic loss of over $800,000,000, and property damage to some 8,000,000 automobiles.

The 1927 casualties, according to figures of the American Road Builders' Association, showed an increase of 1,316 deaths over 1926. Minor accidents were estimated to involve 25,000 automobiles every day of the year.

What do these staggering figures indicate? Do they mean that the American people are becoming inherently reckless at the wheel of an automobile; that our systems of traffic control are antiquated; that the modern automobile is in itself a dangerous instrument; or that each one of these factors makes its contribution toward the general traffic hazards resulting in highway accidents?

Since the year 1922, the number of persons killed annually in highway accidents has been steadily increasing. In the former year, 19,203 persons were killed, as compared with 26,618 in 1927. Fatalities increased 38 per cent during this period, while automotive registrations increased 90 per cent. This would seem to indicate that highway accident fatalities are decreasing in proportion to the number of vehicles in use. For practical purposes this is true. It is a fact, however, that the increase in highway accidents continues to climb steadily, while the annual increase in automobile registrations has failed to maintain its steady upward trend.

This is caused by two things—the increase in population and the wider use of registered automobiles. The National Safety Council has made a careful study of the population factor in highway accidents. The Council believes population to be the most important factor in the annual increase of these accidents. The American Road Builders' Association points out that increased population not only causes more pedestrians to be upon the streets, but it increases the congestion of pedestrian traffic and the resultant confusion in a far greater proportion. This reasoning can only lead to the conclusion that the pedestrian problem in highway accidents is becoming of increasing importance each year. An examination of highway accident statistics will prove this.

Since 1922 the number of pedestrians involved in fatal highway accidents has been increased enormously. Today more than two-thirds of all fatalities are pedestrians. Last year pedestrians were the major factor in causing 11,367 out of 26,618 fatalities, as compared with 11,765 caused principally by motorists. In the first instance virtually all deaths were pedestrians, and in the second a large number were pedestrians. Massachusetts found that pedestrian fatalities were increasing in that state, while motorist fatalities were actually decreasing. The same is true in virtually all states of the Union, particularly in those having a large urban population.

With these truths in mind, it must be concluded that even though the registration of automobiles should not increase at all, the number of highway accidents occurring each year would continue to climb at an alarming rate as a result of the constantly increasing population and wider use of motor vehicles. This gives rise to the immediate need for studies of methods of pedestrian education and pedestrian control in the United States. The National Safety Council has estimated that unless highway accidents are checked, 40,000 persons will have lost their lives as a result of them in 1935. This is no idle warning, as it is based upon concrete facts, with the present increase in population as one of the basic considerations.

The individual causes of highway accidents are generally hypothetical. There may be many contributive causes to a single accident. Broadly speaking, these causes might be sifted to two characteristics of both pedestrians and motorists—carelessness and discourtesy. For analytical study, however, the American Road Builders' Association has prepared the following table of highway accident fatalities during 1927, showing the number of persons killed and the major contributive causes:

FATALITIES CAUSED PRINCIPALLY BY PEDESTRIANS

Children playing in the street or crossing in violation of traffic law	32%	3,638
Adult jay-walking	27%	3,069
Inattention	16%	1,819
Confusion	14%	1,591
Other causes	11%	1,250
Total fatalities caused by pedestrians		**11,367**

FATALITIES CAUSED PRINCIPALLY BY MOTORISTS		
Inattention	32%	3,765
Speeding	23%	2,706
Traffic violation	20%	2,353
Intoxication	9%	1,059
Miscellaneous	16%	1,882
Total fatalities caused by motorists		**11,765**
FATALITIES CAUSED PRINCIPALLY BY PHYSICAL CONDITIONS		
Fog, rain or snow	37%	1,290
Defect in vehicle	19%	662
Skidding	16%	558
Road defect	11%	383
Strong lights	7%	244
Poor street lighting	7%	244
Confusion in dimming	3%	105
Total fatalities caused by physical conditions		**3,486**

Enforceable laws will, in some measure, check those accidents resulting from speeding, intoxication, traffic violation and improper lighting. They will have some effect on adult jay-walking. In general, however, it may readily be seen that any attempt to pass additional laws will not strike directly at the root of highway accident causes, which fundamentally is the conduct of the individual. Last year the American Road Builders' Association estimated that 95 per cent of all highway accidents were caused by carelessness or discourtesy. The foregoing table bears out this statement. The three principal causes of fatalities—children playing in or crossing streets, inattention and adult jay-walking—took 12,291 lives or nearly 52 per cent of the 23,496 fatalities for which causes are listed. No amount of enforceable traffic law will reach those causes.

The first six months of 1928 indicated another increase in the highway accident toll for the present year. When the final figures are made public at the Convention and Road Show of the American Road Builders' Association in Cleveland next January, it is believed that the death total will have reached nearly 28,000 for the year 1928. The conclusions drawn from studies of the accident causes will probably be the same as those for 1927, which are as follows:

First. That the human factor is responsible for 95 per cent of all highway accidents and that the mechanical and engineering factors are responsible for the remaining negligible portion.

Second. That the human factor which causes highway accidents is in a large degree caused by certain definable physical conditions such as conflicting traffic laws, traffic congestion, discourtesy, carelessness, physical incompetency and lack of confidence in the mechanical stability of a motor vehicle.

Third. That the pedestrian problem is increasing while the motoring hazards in themselves are only slightly decreasing.

Fourth. That the alarming number of children killed in highway accidents makes necessary some drastic action in their behalf.

Fifth. That no enforceable legislation will strike at the root of highway accidents.

When faced with an emergency of the kind brought about by the present highway accident situation, the American people almost instinctively turn to law as the remedy. Rational action to reduce highway accidents, however, can not involve the adoption of additional laws, but rather necessitates simplifying and making uniform the existing laws. With confusion and traffic violation among the paramount contributive causes of highway accidents, the uniformity of existing laws looms as an outstanding panacea. With that in mind, the American Road Builders' Association heartily recommends the immediate adoption, so far as practicable, of the uniform state and municipal vehicle laws prepared by the National Conference on Street and Highway Safety. The organization further believes that the examination and licensing of all drivers is essential for the progress toward highway safety.

Any additional move to reduce the highway accident toll must deal directly with the individual. Systems of pedestrian control have not as yet been developed to the point where they might be incorporated into a uniform national vehicle code, and until an adequate and successful system is developed, the various cities of the United States must continue to study their own particular pedestrian problems.

There are some 120,000,000 human beings included in the population of the United States. With this enormous group of people living among 23,000,000 automobiles there must always be highway accidents, both avoidable and unavoidable. It is not unreasonable to believe, however, that the present toll is much too high and that it may be reduced by an appeal to the individual. This necessitates constant education.

The immediate objective of an educational campaign for highway safety must be to instill in the mind of every individual a sense of personal responsibility, a desire to practice the principles of Courtesy and Caution. While it is realized that all persons may not be affected by a campaign of this kind, it is believed that those citizens who do realize the necessity for Courtesy and Caution and who practice it accordingly will eventually have an influence on the conduct of their fellow citizens. The ultimate result will be a national voluntary sense of caution which will find expression in wider roads and streets, uniform signals and traffic laws and sensible personal conduct.

The safety education of pedestrians and motorists of the United States may be brought about only by the whole-hearted cooperation of newspapers, periodicals, churches, schools, civic and social organizations, the radio and through every conceivable medium for transmitting a vital message.

MEN OF THE INDUSTRY

The portraits printed on this page in each number of PIT and QUARRY are taken from our files and their selection is without significance as to current events or as to the position of the individual in the industry.

William M. Hatch

Mr. Hatch is President
of the Peerless Egyptian Cement Company
of Detroit, Michigan

WHAT ORGANIZED SAFETY WORK HAS DONE FOR THE CEMENT INDUSTRY

By E. Posselt
Vice-President, International Cement Corporation, New York City

THE development of the cement industry in all of its branches during the past 25 years has indeed been marvelous, and among the very satisfactory advancements made, safety and accident prevention rank high. It is entirely proper and very useful from time to time to review and discuss our performance, and it is a great pleasure to me to have the honor to present to you on this auspicious occasion, the Seventeenth Annual Safety Congress, a brief paper on "What Organized Safety Work Has Done for the Cement Industry." Accident prevention in the cement industry was started deliberately, not accidentally, and today it has grown until it is no incidental part of our activities. Successful safety work requires the interest and attention of everyone in the organization from the highest official down, and the progress achieved in recent years is certainly powerful evidence of general interest.

Cement company executives who are the guardians of plants and properties have a very definite obligation to conserve and develop human equipment, which, after all, is the great motivating force. But, this is not only a moral obligation; it is good business—it gives big returns. A good plant, from a purely mechanical point of view, can be built in a comparatively short time. An efficient operating organization, however, requires much longer time to build up, and the most exacting efforts on the part of the executives in training the men. A broken bolt can be replaced without a great deal of difficulty; a broken arm cannot be restored to normal function except by the natural process of healing, which takes a long time. It is true that if a man is injured he may be replaced, but the training required to make a substitute proficient is usually no small item, and the change involves loss of time, hard work, and risk, with the result that the substitute, with all of our investment in him, may be no better than the man we had originally.

In many other ways as well accidents destroy the effectiveness and morale of organizations. If one man is injured, the entire force may fear or take a dislike to certain equipment, or may even lose faith in the organization for which they are working. Frequent accidents often drive men to other work, and not infrequently very good men are lost in this way. Consequently, it is not unusual to find high accident rate coupled with a large turnover, and in such cases it is difficult to decide whether the large turnover is due to the many accidents or the many accidents to the large turnover. Nevertheless, these two undesirable factors are closely linked together. In our own industry we notice that last year 347 out of 1,143 accidents were to men employed less than six months, and 486 out of 1,143 accidents occurred to men who had been employed less than one year.

Accidents are a drain on industry and a burden on society. While it is, therefore, to everyone's interest to reduce them, I hope we can succeed in convincing every individual workman that after all the great incompensable cost falls upon the injured and those who are near to and dependent upon him.

To obtain the proper results in accident prevention, organized efforts are necessary; in fact, essential. I would like to emphasize this statement by pointing out my own experience and observations in the plants of the International Cement Corporation. No efforts or expenses are spared to build our plants in the most substantial manner, arrange and install the equipment with every thought of safety, and provide all possible means of accident prevention. We still have a long way to go before we consider that every plant is mechanically perfect as far as safety is concerned, but I have no hesitancy in saying that at least several of our plants are as well protected as modern engineering can provide; and yet we have accidents—in fact, we have suffered some very severe accidents in our most up-to-date plants. This, gentlemen, would emphasize that the personal equation cannot be controlled by machinery, and without the interest and complete cooperation of every man in the organization, accidents cannot be avoided.

Now, let us see what the industry has accomplished during the last few years. In January, 1925, lost time accidents were being suffered at the rate of 28 per one million barrels of cement produced. In July, 1928, this rate had dropped to less than 4 accidents per million barrels. During 1925 lost time accidents averaged 212 per month. By 1927 this rate had dropped to 114 per month. For the first eight months of 1928, they have averaged 88 per month. The accident total for the last three months has only been equal to the total for one average month two years ago. The quarter ending on June 30, which is the last one for which figures are available, shows 10 per cent fewer accidents than any previous quarter and for the half year ending on the same date shows 15 per cent reduction over any previous similar annual period.

Most assuredly these results are worth while, and we can see that we are getting somewhere.

The improvements in the plants and equipment have no doubt been a factor in this performance, but as I pointed out before, without the organized effort of our entire industry through the Portland Cement Association Accident Prevention Bureau, and the individual efforts in every plant, I am sure we would have had another picture to present.

Under the direction of our Committee on Accident Prevention, the Association has furnished us with statistics and information of all kinds pertaining to accidents and their prevention, and has suggested various and sundry methods for the most effective efforts towards accident prevention.

All of this can only be the means towards an end, and each plant organization must after all work out its own salvation, so to speak.

Most of us are inclined to judge the performance on the total and average figures, and without a very careful analysis of all the data pertaining to a problem we may overlook some of the very important facts. This applies to the statistics which we gather on accidents, and if one is content to compare his own performance with the averages and totals of all the other plants, then he may not get as good results as is possible under his particular conditions.

As an example of what individual efforts can produce, I have prepared a table attached giving the accidents and days lost per 100,000 man hours, as tabulated by the Portland Cement Association for 1925, 1926, and 1927, and have shown the corresponding figures for the plants of the International Corporation for this same period.

For the purpose of classifying the performance, it has been customary for the last several years to divide the plants into four groups. The first quarter of the plants reporting and having the lowest accidents come in the first group, the next quarter are placed in the second group, and so on.

This classification shows in every year a very

Association Grouping of Plants According to Accidents and Days Lost Per 100,000 Man Hours with the Location of Plants of the International Cement Corporation

	1925 — 120 Plants Reporting	Per 100,000 Man Hours		1926 — 124 Plants Reporting	Per 100,000 Man Hours		1927 — 134 Plants Reporting	Per 100,000 Man Hours	
		Average No. Accidents	Average No. Days Lost		Average No. Accidents	Average No. Days Lost		Average No. Accidents	Average No. Days Lost
1st Group	Best 30 Plants No. 1-30	.9	12.1	Best 31 Plants No. 1-31	.6	10.2	Best 34 Plants No. 1-34. Ten of these plants were awarded the Association trophy of which the Kansas Portland Cement Company was one.	.2	3.5
2nd Group	Plants No. 31-60	1.5	30.0	Plants No. 32-62	1.6	25.3	Plants No. 35-68	.5	11.2
3rd Group	Plants No. 61-90	2.9	51.8	Plants No. 63-93	2.2	49.9	Plants No. 69-102	1.1	36.2
4th Group	Plants No. 91-120	5.5	110.9	Plants No. 94-124	5.3	113.0	Plants No. 103-134	3.4	104.8
General Average all Association Plants		2.6	49.9		2.2	45.3		1.4	34.6

Location of International Plants in Above Association Groups

		Association No.	No. of Accidents	No. of Days Lost		Association No.	No. of Accidents	No. of Days Lost		Association No.	No. of Accidents	No. of Days Lost
1st Group	No Plant in this Group				Houston	14	.7	8.0	Kansas	3	.0	.0
									Houston	21	.2	4.3
									Dallas	23	.3	5.7
2nd Group	Kansas	38	3.30	27.1	Kansas	39	1.0	21.2	Virginia	37	.4	9.9
	Indiana	45	2.38	29.9	Alabama	42	.7	21.9	Knickerbocker	55	.5	19.0
					Virginia	58½	2.8	33.3				
					Indiana	62	3.8	35.8				
3rd Group	Cuba	63	2.85	41.8	Dallas	83	.7	54.0	Alabama	78	.86	27.4
	Dallas	77	2.31	52.1	Knickerbocker	86	2.6	58.5	Indiana	89	.83	38.9
									Cuba	79½	2.1	31.1
4th Group	Alabama	91	4.26	65.3	Cuba	104	4.5	81.4	*Louisiana	100½	6.4	57.9
	Houston	105	4.62	99.6	Argentine	115	7.0	115.2	Argentine	110½	3.9	65.8
	Argentine	110	8.42	130.2	Uraguay	123	14.5	220.8	Uruguay	132½	15.9	228.0
	Knickerbocker	116	8.13	183.4								
	Uruguay	119	14.20	217.6								
General Average of International Plants		...	5.61	94.1			3.8	65.0			2.8	44.4

*Louisiana operated last half of 1927

1927 — Cuba, Louisiana, Argentine and Uruguay not being listed in the Association report, are given numbers intermediate to regular numbers and properly classified from data supplied the New York Office.

large difference between the first group and the fourth group. The table shows very forcefully the improvement during these last three years.

For our own plants, records are kept along the same lines as those of the Association. We are very strict in the classification of accidents, and under our system and policies there is but little possibility that a lost time accident is not properly recorded.

In 1925, none of our plants were in the first group, and our performance was not as good as the average of all of the 120 plants included in the Association reports. In 1926, we had one plant in the first group, four plants in the second, two plants in the third, and only our foreign plants remained in the fourth group. It is evident that the foreign plants had a good many more accidents than domestic plants, and for this reason we urged the Association not to include the figures of the foreign plants in the statistics, and for 1927 these have been left out.

In 1927, we had three plants in the first group, two in the second, and two domestic plants in the third group, and the average of the accidents in all of our plants was considerably below the average of 134 plants reporting to the Association.

A complete study of the conditions in our own plants, and organized efforts, intelligently guided and systematically enforced, is the only way in which the proper results can be obtained, and I believe the figures presented speak for themselves as evidence of the effect of organized efforts.

While I do not wish to impose on you with too many statements of our own performance, I feel that after all, actual experience and observation is the best guidance for further efforts. I, therefore, feel justified in calling attention to just one thing in connection with our experience outside of the United States. Here at home we have all seen accident prevention grow from a rather insignificant activity some 15 or 20 years ago, until its present day enormous importance, and to some people it may be like watching a growing child, it is difficult to realize and to appreciate the changes and the developments that take place.

Four or five years ago, we began to implant the American methods of Safety Prevention in our foreign plants. Many of us operators who are familiar with conditions were skeptical as to results, and very discouraged during the first few years. We were operating in countries where industry was but little developed, and the great mass of labor instead of being interested in preventing accidents were rather inclined to use any little injury as a pretext for laying off. Real efforts date back only to 1925, and it is simply astonishing to note the interest that the men themselves are taking in this work today, and the figures which are given on the table show a very marked improvement, and I can further state that still better results have been had during 1928. Without organized safety work this improvement would not have been possible.

It is not for me to comment on the methods and details of our safety work. This is referred to on many occasions and is constantly being studied and considered by our committee, and its able chairman. A question that many of us no doubt feel inclined to ask is, "Does this work pay dividends?" Does anything which reduces the interruptions in our operations, which cuts down the clerical work, which minimizes labor turnover, which saves medical expenses, and which builds up the morale of an entire organization have any cash value? The answer to these questions is, of course, that it does. We, in the cement industry, are convinced that it does from the results in our own plants. However, this answer was further confirmed in an investigation on Accidents and Production, by the American Engineering Council, and a report on such an investigation was presented before the meeting of the American Society of Mechanical Engineers at the Spring meeting at White Sulphur Springs in May, 1927. The findings of this investigation was based on information from about 14,000 companies and show conclusively a distinct relation between accidents and production.

I am impressed with the interest the executives are taking. It reflects their belief that accident prevention is worth while, and their desire to be helpful to the men. Without the encouragement of the executives, accident prevention activities have a hard time of it in any mill. I have also been impressed with the awakening that has come to our superintendents and foremen, and it is a splendid sign to see the foremen voluntarily accepting more responsibility of this kind.

Our work has an additional value, incidental perhaps, but nevertheless important. It is earning for us the respect and confidence of the public. Industrial publications regard reports of our accident prevention progress as important and give this news the prominence which it deserves. Even the daily newspapers publish current reports of our safety work, because they realize that the progress we are making is of public interest. Comments are not limited to the papers of the small cities and towns where the plants are located, but the leading papers of the country are giving splendid publicity to our work.

Popular interest in our accident prevention work is building popular respect for us among the public at large. The public is beginning to realize that the cement industry is taking active steps towards reducing accidents in mills and that it is working in the interest of its employes. It is beginning to realize that our mills are safe places in which to

work—probably much safer than our streets and highways.

But let us not become self-satisfied with results. We still have accidents that must be avoided.

Accident prevention was first taken up as an important Association function in 1913. Our efforts are being better organized from year to year. More and more interest is being taken by the member companies, and the interest of the employe has been aroused to a point where I confidently predict great improvements for the future. There are today in this country a total of 157 plants manufacturing portland cement—137 of these plants cooperate actively through the association in accident prevention work. These 157 plants are owned by 95 companies. Of these companies 80 belong to the association and, therefore, contribute not only by their interest in the work, but by financial support as well. There can be little doubt that the cement industry has developed to its present state of importance largely through cooperation expressed most forcibly by means of the Association. The policy of the open door which has always prevailed with practically all the member companies has been a powerful factor in the tremendous growth and splendid advancement of the industry.

This same open door policy is to the advantage of members and non-members alike, and our organized efforts towards accident prevention reflects itself to the benefit also of the men who work for the companies that enjoy the fruits of the Association's efforts without being members and taking part direct in its work.

While we have made an excellent record in the past, we are looking hopefully to the future. We have proved to ourselves that accidents can be reduced, and during the coming years, we must show the industrial world that cement which is one of the greatest human benefactors, making possible, as it does, safe roads and safe structures of many kinds, can be manufactured without accidents to those who labor to make it.

Gasoline Per Car

The United States uses 500 gallons of gasoline yearly for each automobile in the country. In 24 states the average consumption is greater than this amount; in the other 24 it is less. These facts are disclosed by a study of the gasoline consumption records of the American Road Builders' Association, in connection with the latest automobile registration data of the U. S. Bureau of Public Roads. Automobiles in certain sections of the south make greater use of their machines than do car owners in any other part of the country, gasoline data for the various states indicate. Georgia uses an average of 639 gallons per car yearly, it is found, leading all other states. In Florida fuel consumption averages 628 gallons, and in Alabama 605 gallons. Next in order follow California with 601 gallons of gas per car, Louisiana 594 gallons, New Jersey 573 gallons, and Connecticut 568 gallons.

In many of the larger and more populous states the average gas used is shown to be comparatively low. Pennsylvania burns 440 gallons per machine, or 60 gallons less than the U. S. average. Massachusetts uses 453 gallons, New York 461 gallons, Ohio 491 gallons, Michigan 514 gallons, and Illinois 522 gallons.

Business Profits for 1928

Business profits in many lines are larger this year than a year ago, it is indicated by data compiled by the Federal Reserve Bank of New York. Net earnings reported for the first half of 1928 by 222 corporations in leading industries are found to aggregate 9.3 per cent greater than in the first half of 1927. Profits of 184 public utility concerns in the same period were 9.6 per cent larger than last year. Earnings of 185 railroads show a 2.3 per cent decline.

Motors are shown to rank high among the industries reporting gains, with a profit increase amounting to approximately 21.6 per cent. Mining and smelting earned 20.0 per cent more than a year ago. Other gains were: Chemicals 12.5 per cent, machinery 4.1 per cent, food and food products 2.9 per cent. Smaller profits are reported for tobacco 20.0 per cent, oil 15.6 per cent, and steel 6.9 per cent.

Employment Increases

Employment in manufacturing industries shows an increase in the newest data gathered by the U. S. Labor Department. Eighty-six persons were at work in manufacturing plants in August for each 100 on the payrolls in 1923, the Labor Department figures reveal. In July the ratio was approximately 84 employed for each 100 holding jobs in 1923. Employment in August is found to be at the highest level since March. In that month also the ratio stood at approximately 86. In April it declined to 85, at which level it remained during May and June.

The Labor Department each month receives reports from more than 11,000 manufacturing concerns in 54 industries. The same plants report each month, so that by a comparison of the returns the trend of industrial employment may be determined. This in turn is believed to be indicative of employment conditions in the country as a whole.

IMPROVING THE QUALITY OF CEMENT

By H. Richarz

THIS article is concerned with improving the quality of concrete. Naturally, if this is to be done, it is first necessary to improve the quality of the cement used in making the concrete, as well as of course the quality of the other materials that are employed in concrete mixing. The importance of using the correct proportions in making up the concrete is also stressed.

As far as the cement itself is concerned, the author first reviews in a general way the characteristics and properties of cements as well as the usual methods which have been employed in the manufacture of these cements.—Editor.

The question is how the quality of the cement can be improved. There are two different ways in which this can be done. In the first place it is possible to improve the properties of the cement itself, and in the second place it is possible to make the cement better suited for a definite use. Many attempts have been made to improve cements and hence the concretes that are made from them, and, while some of them have been successful, others have not, for the reason that the experimenters were not properly acquainted with the basic principles that underlie the manufacture of cement and also the phenomena that take place during its use. Furthermore, even when the cement has been improved in quality, full advantage of such an improvement is often not taken by the user for the simple reason that he may not be sufficiently well versed in the technological details of its use.

(The author at this point describes the historical progress of the efforts made to improve the quality of cements. Some of this is of no particular importance and is therefore omitted. A few of the most interesting developments are discussed below.—Editor.

An interesting cement product was brought out on the market some years ago under the name of Solidit cement. This is an "improved" cement, the improvement consisting of the addition of granite or diorite in pulverized form to the finished cement. The pulverized stone is first heated for about two hours to a temperature of approximately 1000 degrees C before it is added to the cement. The heating has the effect of increasing the soluble silica content of the stone, and then this soluble silica is in a position to combine with the free lime in the portland cement. The result is that the quality of the cement is materially improved. Investigations have been carried out on this particular subject (see Die Betonstrasse, 1927, number 8, pages 166ff.), and these investigations have established the fact that the content of soluble silica in the unburnt pulverized granite is 1.80 per cent, while that in the ignited granite flour was three per cent. It must therefore be evident that the slight increase in the silica content of the granite and other stone is not sufficient to warrant the conclusion that heating the granite will produce a product which, when added to cement, will materially improve its quality. It should be pointed out here that definite conclusions have been drawn from experimental observations that the addition of such substances as glass powder, pulverized granite or other stone to the cement does not have a very material effect in improving the quality of the cement, although it may, of course, cause a slight improvement. For these materials do not prevent the cement or the concrete that is made from it from shrinking, which is, of course, a highly undesirable characteristic. It has been held that these substances are really not substitutes for cement but merely fillers, and hence they should have the desired effect of reducing the tendency of the cement from shrinking, particularly because they contain a considerable percentage of hollow space. Nevertheless, while such an action is well known, it is not obtained when these materials are mixed with the finished cement and hence act as cement substitutes.

Another process which has been recommended as highly efficient in improving the properties of cement is based on the contention that when the cement is heated the "injurious carbon dioxide" is driven out of the cement. It is claimed that the improved cement has the following advantages: In the first place only half as much of the improved cement need be used to obtain the same results as with ordinary cement. In the second place, the structures that are formed with the aid of this improved cement become stone-hard within a short time, are of clear, clean color, and are free from cracks and blooming.

It must be pointed out that this contention is entirely erroneous and is based on a complete lack of knowledge of the fundamental principles underlying the manufacture and use of cement. No carbon dioxide is contained in a well-sintered cement. The sintering temperature of the cement lies between 1400 and 1500 degrees C., while the carbon dioxide is driven out of the raw cement mixture at a temperature of 900 degrees C. When carbon dioxide is found in cement which has been stored in air for a long time, it may safely be concluded that the origin of this carbon dioxide is the atmosphere. However, the presence of this carbon dioxide in the cement is not at all harmful, but

rather useful in a very high degree, so that the removal of the carbon dioxide from the cement by its ignition is an entirely useless procedure. The usefulness of the carbon dioxide that is absorbed by the cement from the atmosphere depends on the fact that not the lime-silica, lime-alumina and lime-iron oxide compounds in the cement, but only the excess lime, which is present in certain instances in slight amount in the cement, is able to combine with the carbon dioxide.

It has been known for a long time that long ignition of a portland cement will have an injurious effect on it. Experiments have recently been carried out and have determined that all cements are not only not benefited by ignition but that without any exception their strength is materially decreased by such treatment. Furthermore the initial set of the cement is very unfavorably affected, for the reason that rapid setting cements are invariably formed by the ignition process.

The author recently examined what was proposed as a cement improver. This was a yellowish white powder which had a fatty feel, and which was recommended to be mixed with cement and trass in the following proportions: one part of cement, one part of trass and one part of the cement improver.

It was claimed that greater strength and resistance to acids would be obtained with this cement mixture than otherwise. The chemical analysis of the cement improver gave the following results: insoluable in hydrochloric acid 85.20 per cent, water of hydration 14.45 per cent, silicic acid (silica) 44.75 per cent, alumina 39.15 per cent and iron oxide (Fe_2O_3) 1.60 percent, making a total of 99.95 per cent. It must be concluded from these analytical results that the cement improver was essentially a kaolin, that is a substance with the following composition: $2SiO_2.Al_2O_3.2H_2O$, which contains iron oxide as an impurity.

It is impossible to see how a mineral which must be decomposed to as much as eighty-five per cent in the course of the sintering process, and particularly one which does not contain any soluble silica, can improve the chemical properties of cement. Such a powder can have only a physical action, when it is employed in the proper proportions. This physical action is to make the cement more dense. The investigation also revealed the fact that not only is the strength of the mixed cement not superior to that of the ordinary cement, but the strength is actually less. Thus two tests were made. In the first case the unmixed portland cement was mixed with sand in the ratio of one to three, and in the second case the portland cement was mixed with trass and also the improver in the ratio of one third each. Then this mixture was mixed with sand in the proportion of one to three. Strength tests were carried out on the sample after they had been allowed to remain for seven days under water. The strength in tension in the first case was 26.0 kilograms per square centimeter and in the second case only seven kilograms per square centimeter. The strength in compression in the first case was 323 kilograms per square centimeter and in the second case only seventy kilograms per square centimeter. Inasmuch as a reaction does not take place with the cement, the latter remains unchanged. Hence it also follows that the cement improver cannot make the cement any more resistant to the action of acids.

It therefore remains that the only way in which the quality of cement can be improved and in which it has been improved is by changes in the method of grinding and burning carried out in the cement mill itself. It must be pointed out here that an intensive chemical combination of the individual ingredients of the cement can take place in the modern kiln. This reaction naturally makes the cement more valuable than formerly. Furthermore, the fineness of the grinding of the cement has continually been increasing, so that its reaction with the water used in making up the cement mixture has been continually improving. The tests that have been made on cements since the year 1902 have shown in very clear manner the great improvement that has taken place in them.

The manufacture of aluminous cement and also of super-cement should not remain unmentioned as constituting important steps in the improvement of cements in general. The properties and characteristics of these cements are too well-known to require explanation here. The composition of aluminous cement, or molten cement, is quite different from that of ordinary portland cement. It is also ground more finely than ordinary cements.

While a general improvement in the quality of cement has been effected by improved manufacturing methods and the manufacture within recent times of both super-cements and aluminous cements, the most recent development along these lines is the application of a cement for a given purpose, that cement possessing properties which make it best suited for that purpose. In other words improvement in cements is found when they are used for specific purposes.

Thus one of the most important problems in the cement industry has been the manufacture of a cement which would behave well when used in structures that have to resist the action of sea water. Observations on the behaviour of concrete structures under sea water have shown that portland cement is particularly well-suited for this purpose, when a dense concrete is made, so that the sea water cannot penetrate into the structure. It was indicated some time ago that the liberation of lime

during the hardening of cement and the combination of this lime with the salts contained in salt water formed the basis of a recommendation that pure portland cement cannot be used in building under sea-water structures. It was therefore thought necessary to add substances to the cement that would combine with the harmful lime before it could enter into a reaction with the ingredients of sea water. However, when dense concrete is formed, it becomes unnecessary to add such substances to the cement.

A number of experiments have been carried out in which the cement was mixed with trass and the like in order to determine the value of such additions to the cement. It has been concluded from these experiments that such additions, even when made in preparing concrete for use under sea water, are of limited value only.

Nevertheless, trass cement has its uses, or rather it is claimed that it has. It is true that this addition to cement has its value when the structures are to be subjected to the action of sea water, for it prevents the chemical decomposition of the cement. Hence a cement which contains this ingredient may be held to be stronger than one which has not, for in the case where trass is used the chemical influences which cause a reduction in the strength of the cement cannot affect the latter. However it has amply been proven that in all other cases the use of trass reduces the strength of the cement. Nevertheless reports are found in the literature which indicate that such is not the case, and hence it must be concluded that the question is still unsolved. It has also been pointed out that in those experiments where the addition of trass and the like has proven to be beneficial, this effect is really due to the use of a fine grade of sand in carrying out the strength tests. The final conclusion is that trass and other extraneous substances cannot be properly added to the cement except where the mixture is thereafter employed in building under sea water structures, that is where other properties of the cement, such as chemical resistance and elasticity are more important than the strength of the cement.

For the same reasons that trass has been used in preparing cement mixtures, so has ground brick dust (common red brick) also been employed. Thus good results are claimed to have been obtained by using a mixture of six parts of brick dust and ten parts of Portland cement. In this case as well the free lime, that is the lime that is set free during the hardening of the cement, is combined with the soluble silica in the brick dust, and thus the deleterious action of the ingredients of sea water on this lime is prevented.

Other puzzolanas, both natural and artificial, have also been used in admixture with portland cement for use in building under sea water structures. It has been established that the strength of the mortar is proportional to the content of soluble silica in the puzzolanas.

The destructive influence of sea water on cement is due to the presence of magnesium sulphate, the sulphate radicle of which combines with the lime and the alumina in cement to form calcium aluminum sulphate, $3CaO.Al_2O_3.3CaSO_4.3H_2O$. This compound undergoes a sharp expansion in volume when it crystallizes out of the solid mixture and causes the disruption of the concrete. In order to remove the main basis for the formation of calcium aluminum sulphate, Michaelis (see German Patent No. 143,604) replaced the greatest portion of alumina in cement by iron oxide, which is also an important hydraulic factor. This led to the manufacture of iron cements.

The problem of making cement structures impermeable to water has also been attacked from the cement side. Thus German Patent No. 142,272 describes a process for the manufacture of water-impervious cements by taking finished cement which has not yet been ground in the proportion of one hundred parts by weight and mixing it with 0.245 part by weight of stearin, 0.013 part by weight of potash and 0.01 part by weight of rosin which have been made up into a slime with ten parts by weight of water. The mixture obtained in this manner is then dried and finely ground. The water-repelling properties of such a mixture are consequently due to the presence of fatty substances in it. Mortars made in the proportion of one to six with this cement mixture are claimed to be perfectly impervious to water. It has been established that a certain water repulsion is obtained with such a cement, but when the water pressure was as much as five millimeters, then the resistance of the cement was no better than that of ordinary portland cement to the passage of water. When it is remembered that in lean mortars, there is always present a large amount of free space, it must be concluded that the water-repellant properties of such cements can only be slight.

It may also be mentioned that a water-repellant cement has been patented in German Patent No. 296,537 in which paraffin and similar substances are added to the warm clinker. The paraffin is rendered liquid by the heat in the clinker and is then sucked up into the pores of the cement.

Mention must also be made of a special type of cement known as Siccofix cement. This is a product which is claimed to be rendered water-resistant by a special process. Investigation has shown that this cement has a normal setting time, that it maintains an unconditionally constant volume, that its strength is good and superior to that of ordinary cement. It is also completely impervious to water

from the technical standpoint and is completely resistant to the action of different, concentrated corrosive solution or at least these have but little effect on it. It is also without any rusting action on the steel reinforcement with which it is employed, even when the structures are subjected to the action of salt water.

A fatty salt is used in the manufacture of this cement. This fatty salt is combined with the lime that is set free during the setting and hardening of the cement with the formation of insoluble calcium salts of the fatty acids. This substance or substances fill the pores of the cement instead of lime hydrate, and consequently makes the cement impervious to water, provided too lean a mixture is not made. The impenetrability of liquids through such cement is limited not only to water but also to liquids of all sorts, such as salt water, brackish waters, waste liquors from factories, weak acid solutions, etc. However, the resistance of such cement to the penetration of water must cease when the calcium salts are washed out. The water-repellant properties of this cement must also be the cause of the protection which this cement offers against the corrosive influence of water and salt solutions on the iron or steel imbedded in the cement. The presence of calcium salts of the fatty acids also makes the cement perfectly constant as far as volume is concerned and it explains as well the claim that the strength of the cement is improved. Inasmuch as all excess lime or lime that is set free during the setting and hardening of cement is combined with the fatty acids, no lime is present in the cement, thus removing one of the most important influences which tends towards the disruption of the cement structure. The insolubility of the lime salts also has the effect of rendering the cement permanently dense, so that reduction in strength does not ensue, and in many cases in fact an increase in strength takes place.

Cost Studies of Slate Industry

For the past eight years the United States Bureau of Mines, Department of Commerce, has devoted considerable attention to the slate industry, first in making a detailed study of the technology of mining and manufacture, the results of which were published as Bulletin 218, "The Technology of Slate." Subsequent studies dealt with special problems, the latest being the introduction of the wire saw in quarries.

The intimate knowledge thus gained of all phases of slate production has brought to light certain business or economic problems, the solution of which would lead to increased growth and prosperity in the industry. As a first step toward a consideration of these problems, the Bureau of Mines, with the support of several leading producers, has undertaken a detailed cost study of slate quarrying and manufacture.

A cost questionnaire, compiled with the assistance of the National Slate Association and several producers, has been submitted to 111 slate producers. It is expected that results of value will be obtained, not only in establishing better cost accounting systems, and in stabilizing the industry, but in pointing out avenues for further profitable investigation.

Largest Sewage Treatment Plant Opened

The largest sewage treatment plant of its type in the world was officially opened here this week by the Sanitary District of Chicago. The North Side plant, as it is called, covers 97 acres and was built to purify the sewage of an ultimate population of 1,340,000. It serves an area of 78 square miles, which includes eight suburbs as well as a large section of the city of Chicago.

Construction of sewage treatment plants in cities and villages has progressed during the last few years as part of a nation-wide fight against polluted water and water-borne diseases. Congestion of population has made it necessary to treat sewage artifically in order to prevent the spread of epidemics.

The Chicago plant was built as part of a program to dispose the city's wastes without injuring neighboring communities.

Formerly the Sanitary District treated all its sewage by diluting it with water from Lake Michigan and sending it through a canal 30 miles long to the Illinois river. This method was opposed by Great Lakes cities which claimed that it was lowering lake levels and by cities along the Illinois river because of pollution of the river water.

The controversy came to the attention of the Secretary of War, who permitted Chicago to continue this procedure on condition that it would begin installation of sewage treatment plants. The newly opened plant, supplemented by three already in operation, one being constructed and one being planned, will eliminate the necessity of drawing heavily on Lake Michigan for water and will bring to an end the heavy pollution of the Illinois river.

The North Side plant utilizes the "activated sludge" process, in which the sewage is sent through screens and settling tanks, where most of the solids are removed. It is then turned into large basins where air is blown through it. This air starts a biological action in the sewage which destroys the impurities. After the aeration has been completed, remaining fine solids in the sewage are allowed to settle out in sedimentation tanks, and the liquid, which is then harmless, is turned into an adjoining channel.

GRAPHIC CHARTS AS AN AID TO SELLING

By J. J. Berliner

THE sales department of any organization must of necessity collect a large amount of data in order that the salesmen may intelligently be directed. It is absolutely essential to keep in constant touch with the progress of events. The sales manager must know from day to day, week to week, and month to month how the sales are progressing, what the expenses of the sales department are, and whether the salesmen are performing efficiently.

Records of sales in various territories as made by various salesmen or of the same salesmen in the same or different territories over a period of time are often an index of efficiency. In nearly every line of business, certain statistics are also used as a measure of present efficiency or as a means of determining future possibilities. For example, the sales of all or certain lines of a concern's product may be compared with the total population, or perhaps with certain classes of population.

Graphic charts are the best method of presenting valuable statistics and information in the sales department. They give the sales manager the information he must have more concisely, quickly and clearly than anything else would. They present the best means for comparison and analysis—two things with which the sales department is constantly concerned.

Graphic charts will show better than any other method such important sales facts as:

(1) Total sales compared with sales "quota" or estimated sales. On the same chart may be shown the monthly variations.

(2) A comparison of sales by districts—cities, states, etc.

(3) A comparison of sales resulting from various sources or methods, such as advertising, mail, salesmen, dealers, etc.

(4) A comparison of the sales of different commodities.

(5) A subdivision of sales expense—salaries, salesmen's expenses, etc.

(6) The performance of the various salesmen, such as:

Number of prospects reported
Number of calls made
Number of orders obtained
Average cost per order
Ratio of calls to prospects
Ratio of orders to calls.

Figure 1 illustrates total sales compared with sales "quota" or estimated sales. Suppose, for example, that it had been planned to sell $60,000 worth of a certain article during the year. The average monthly quota would then be $5000. In Figure 1 the straight horizontal line represents the monthly quota of $5,000. The diagonal line from 0 to $60,000 represents the cumulative quota. These two lines are drawn on the chart at the beginning of the year and represent a standard to be obtained. Then from month to month, as the actual sales are reported, they are plotted upon the chart (the dotted line) and a picture is thus obtained which shows whether the sales, both from month to month, and the total, equal the mark set.

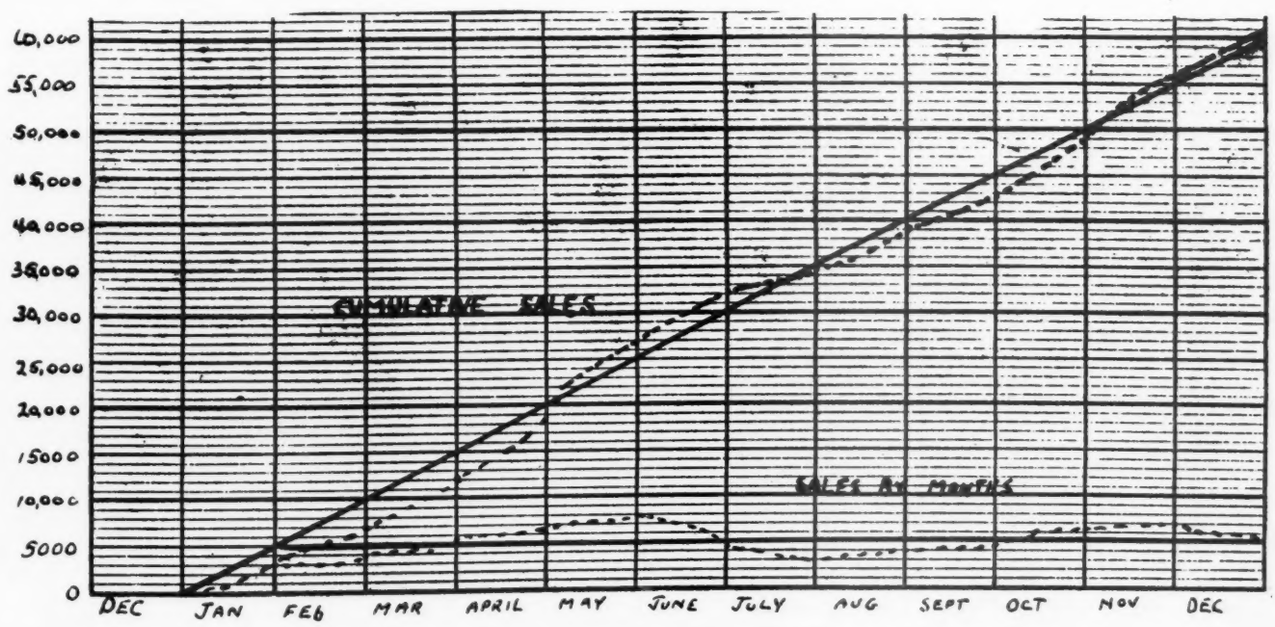


FIG. 1 CHART SHOWING COMPARISON OF ACTUAL SALES WITH SALES QUOTA

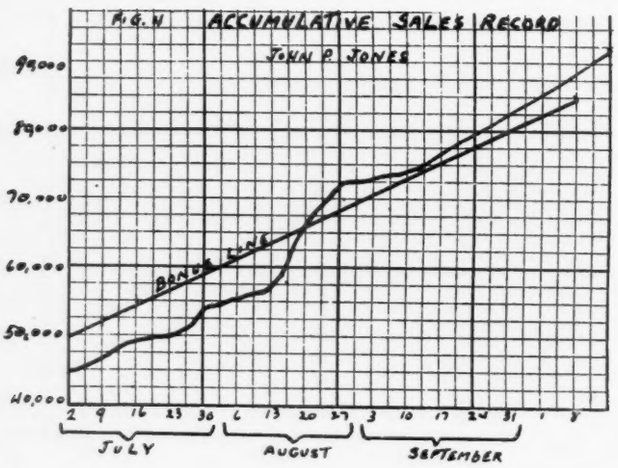


Figure 2 is a graphic chart of the gross business secured by a salesman over a period of a year. This chart clearly shows the effect of the season of the year on the amounts of sales. Special causes of rises and falls in the gross such as this may be noted on the chart to aid in the analysis of the facts.

A chart showing the relation of the number of orders to the number of calls made by a salesman is given in Fig. 3. This is an efficiency chart of the salesman. As time goes on, it is reasonable to expect that the ratio of orders to number of calls will increase. If it falls it may be the fault of the salesman or of general business conditions. This may be determined by comparing his chart with those of other salesmen.

In selling campaigns it is advantageous to keep statistics of the progress made to stimulate business. For instance, a concern may pay a monthly bonus to salesmen for any excess in sales over the normal increase ordinarily to be expected from the growth of the company. The main problem is then to determine what would be the normal sales for the period if no special drive was being made. The average sales would probably be computed for several years past and on the basis of these figures a total estimated amount of normal sales for the coming year would be computed, figuring the same per cent of increase over the previous year as had been made annually in the past. As the volume of sales fluctuates from month to month, due to seasonal and other conditions, it would be necessary to divide the total estimated normal sales for the coming year on the basis of the proportions which had come in each month in the past, using the results of several years as a basis. The estimated normal sales per month would have to be split as outlined above, but modified where local conditions in certain territories seemed to require more or less arbitrary adjustments. Bonuses would then be paid for any increase of actual sales above these normal figures.

Graphic charts can be used with great advantage in sales stimulation. The salesman is made to see vividly exactly where he stands, either in relation to his own previous performance or in relation to the performance of other salesmen. There are so many varieties and combinations that are possible that an ingenious sales manager finds the supply almost inexhaustible.

Comparisons with a salesman's previous record or with his individual bonus peg or budget quota, are generally fair. Comparisons of performance with other salesmen should only be made when conditions are equalized. It is universally realized that one territory may yield a given amount of sales while the same selling ability and energy applied in another would yield but half as much. Modern point systems and quota systems of rating and apportioning territory equalize these conditions, and where these are in effect comparisons are quite fair.

Graphic charts are unusually effective in stimulating *persistence* in sales competitions. They provide this stimulant by bringing home vividly

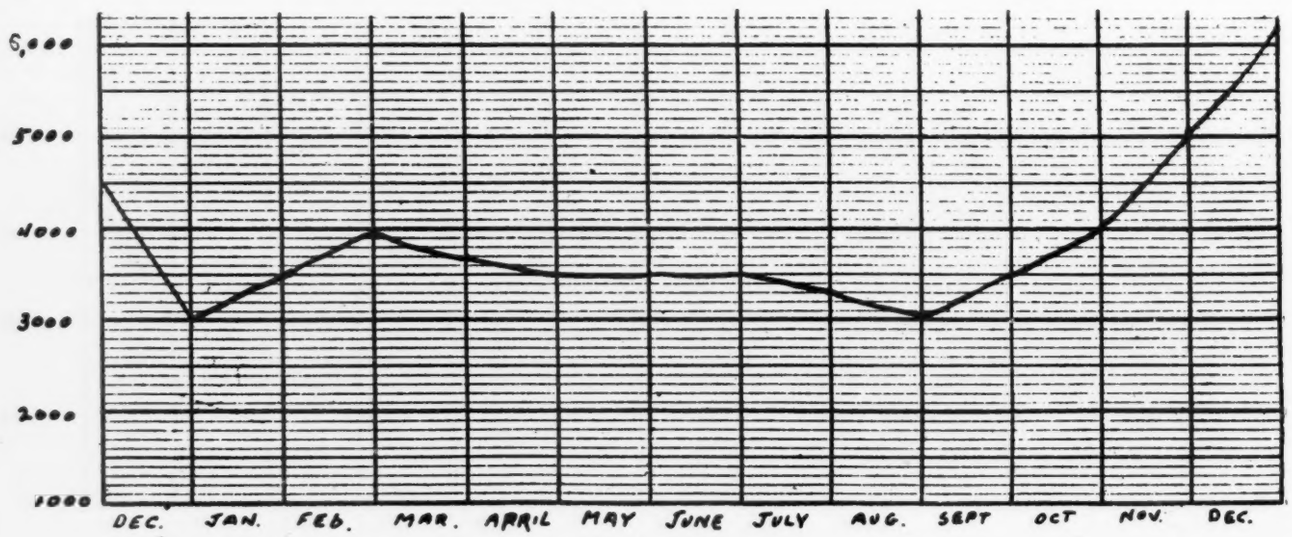


FIG. 2 GROSS BUSINESS SECURED BY A SALESMAN

to each salesman the spirit of competition which exists in those worth while, combined with a means of recording results that helps to turn the work into play. There are so many chances for variety that the story never grows old, for the sales manager can draw from the field of baseball, football, six-day bicycle races, golf, etc.

There is sound business psychology back of this plan of stimulating persistence. The old school salesmen may perhaps ridicule the idea. But it is interesting to note that, however, where such plans have been introduced it is not many weeks before the old timers as well as the younger generation are observed earnestly studying the charts and striving to keep their records above par.

A chart like figure 4, corrected up to the current date, is sent weekly to each salesman. It shows him at a glance whether he is earning a bonus or not, and if he is, whether the bonus is increasing or diminishing. This chart is of the simple "comparative" type, the comparison being in this case against the bonus "peg." It is made to fit the sales book.

Figure 5 is a graphic chart showing weekly performance, the comparison being made between all salesmen, or all in a certain class or territory. The rectangle representing the salesman to whom the chart is sent is put in black so he can easily visualize his performance as against his fellow salesmen. Figure 6 on the same principle shows accumulative sales since the first of the year.

Figure 7 is another simple "comparison" chart for salesmen. In this case the comparison is last week's performance against the average to date for the year, half year or quarter. The arrows are put on with rubber stamps, and a new chart is mailed each week. This chart tells the commission salesman at a glance just what annual salary rate he is earning.

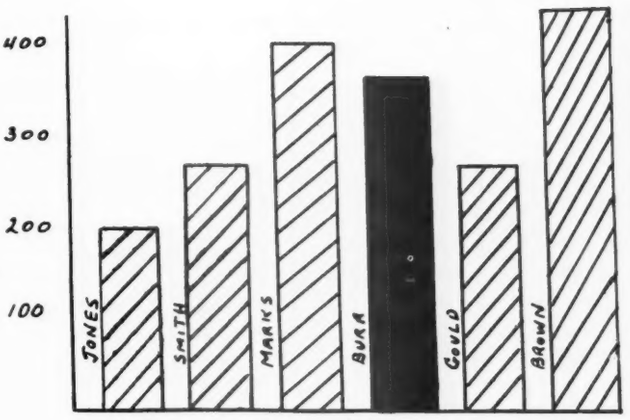


FIG 5 - WEEKLY PERFORMANCE OF SALESMEN SEPT 12, 1928

Keeping the Cost of Selling Down

Sales work is based upon an intangible commodity, human nature, in both salesman and buyer. It is impossible to know exactly to the penny whether a salesman is producing at the minimum cost in a given territory. Again, some buyers are quick to decide, while others will take a day to transact business that could be finished in an hour. Some customers buy in smaller quantities than others, and it is necessary to see them frequently; others buy heavily and need to be visited much less frequently.

There is no means of devising a hard and fast system of cost as we could in the factory. All that can be done is to work out a fairly accurate system.

The first step is to fix for each territory what is considered to be an equitable standard of cost. In one territory the standard might be double that in another. Where selling costs by territories are already kept, they form the basis of the standard. Where the costs as a whole only are available, it is necessary to work out an approximate cost for each territory.

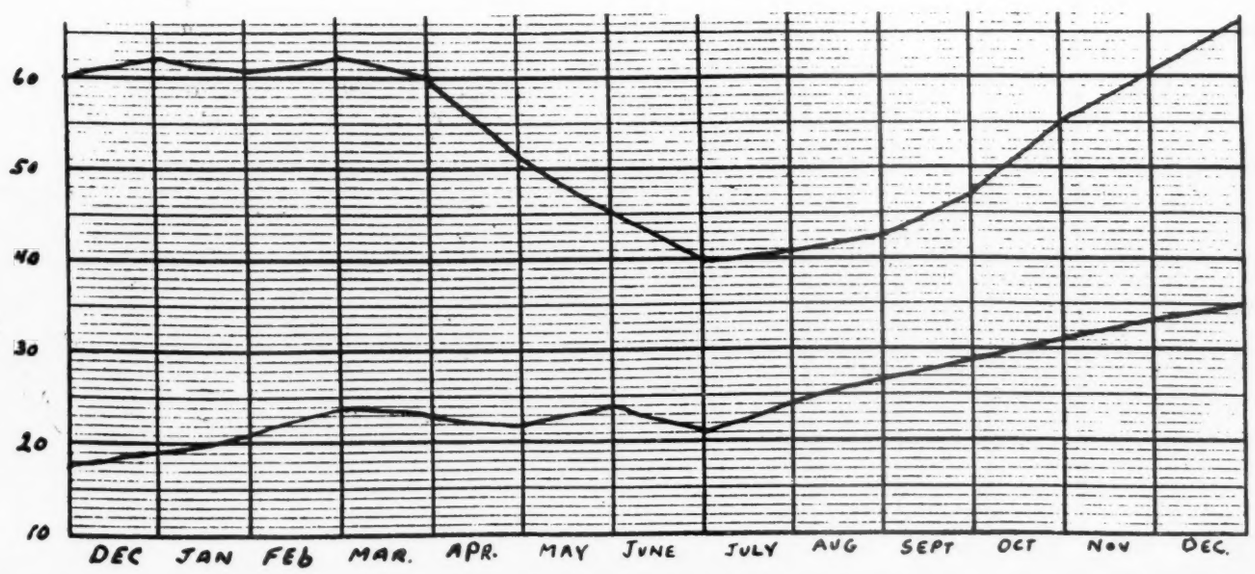


FIG 3 RELATION OF NUMBER OF CALLS TO NUMBER OF ORDERS

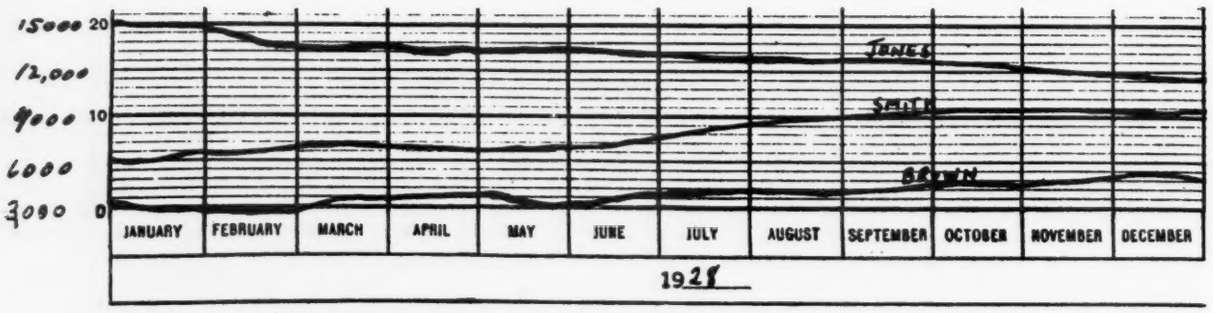


FIG 8. ACCUMULATIVE MONTHLY AVERAGE OF SALES

The unit of product affords the best basis for fixing this standard. In addition to the standard selling cost, a quota of sales for each territory should be established.

In figuring the actual cost, the salesman should be given credit for all business from his territory, whether he actually sends in the order or whether the concern receives it by mail.

In fixing both standards of sales cost and quotas, it is wise and justified in figuring the cost a little low and the quotas a little high. Of course, one should be careful not to put the cost too low, or the quotas too high, and thus discourage the salesman.

The sales manager should always keep the idea of reducing the unit cost of sales before each salesman in the most convincing form. Any increase in the quota, of course, is a step tending toward the reduction of sales cost. Graphic charts visualize these facts. In Figure 9 the heavy line is the quota for a territory covering a period of twelve months, and the dotted line shows the actual sales.

With these figures so graphically present, it is a very simple matter to make up new quotas each year. Usually it is the rule to plan for a certain percentage of increase in sales over the same months of the previous year. Thus, for instance, in Figure 9, the curve shown makes allowance for the usual dull months of the summer. As a rule, the standard of sales cost or a sales quota should be based on the same month of the preceding year rather than the previous month of the same year.

In both of these charts the lines representing the quota and the standard cost are drawn in when the charts are made up at the beginning of the year. At the end of each month the curves showing the actual sales, or the actual cost to date, are drawn in and sent to the salesman.

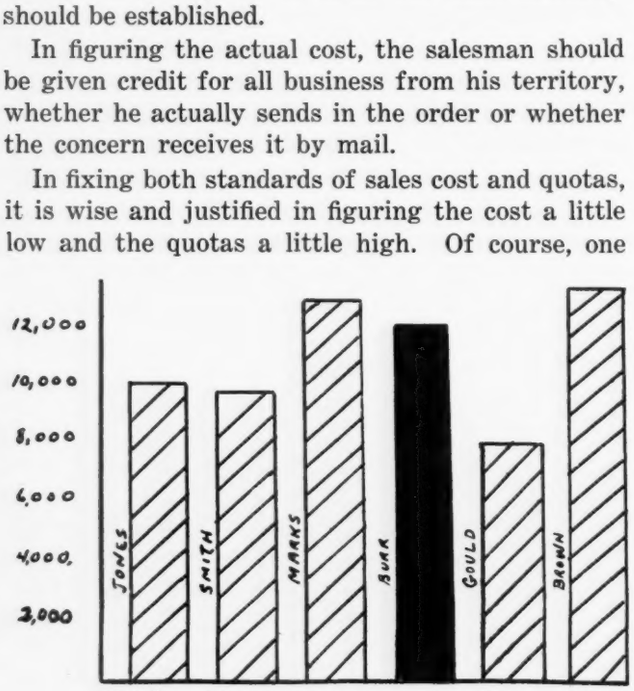


FIG 6 ACCUMULATIVE TO SEPT. 14, 1928

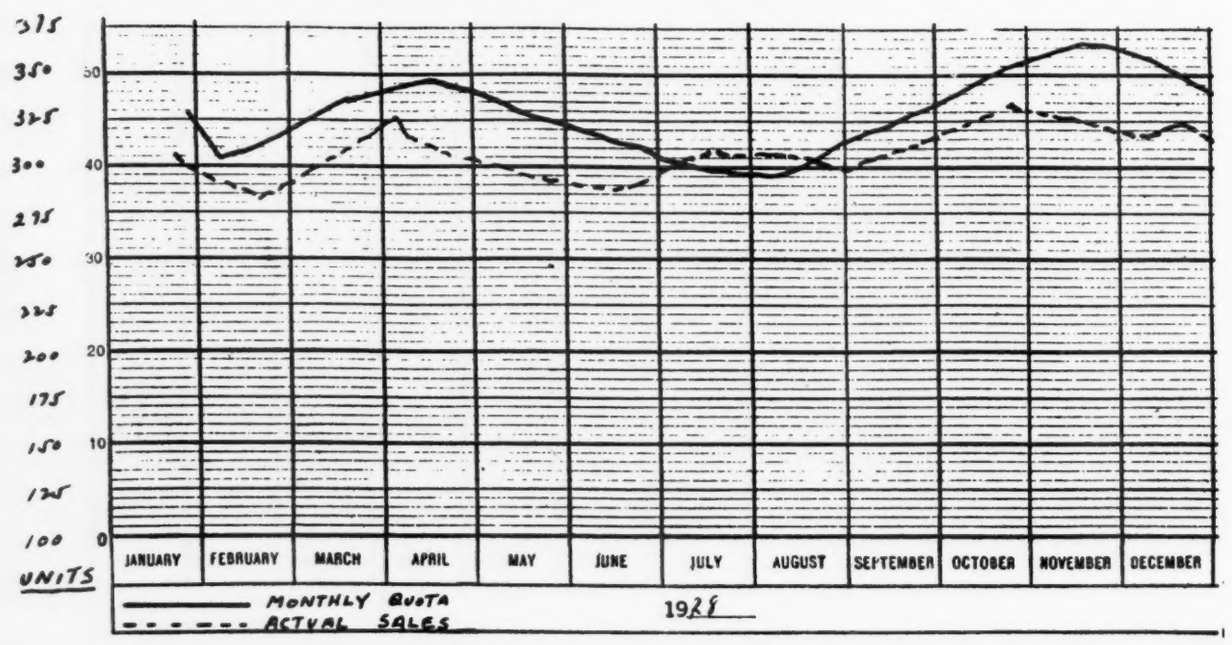
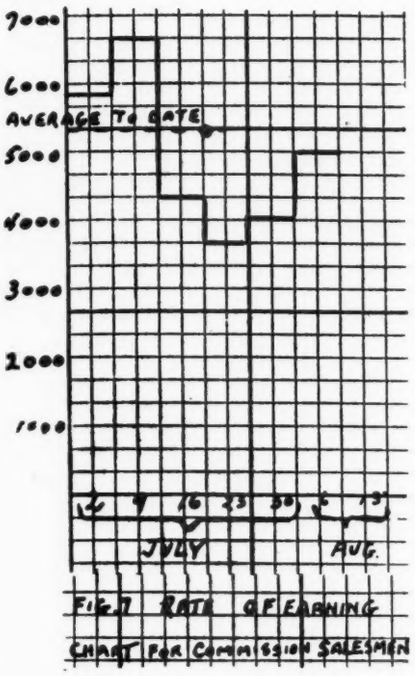


FIG 9 KEEPING UP TO QUOTA



Use of Maps in Graphic Sales Analysis

Outline maps are very valuable in aiding the sales manager to visualize the progress of events in his department. Upon such maps may be shown the sales by territories. Either different colors may be used to designate the sales, such as a red dot for 0-$1,000, a blue dot for $1,000-$2,000, etc., or else the actual figures of the sales may be written directly upon the map. Where various products are being sold, the sales of each different kind may be shown according to locality and will indicate how the locality affects the sales of each kind.

The outline map is also useful for charting general information about each state, the desired data being marked right on the map and following some predetermined sequence, such, for example, as: (1) total population; (2) percentage of population engaged in agricultural pursuits; (3) in manufacturing; (4) number of cities with population, etc., depending upon the facts that are considered valuable, of course. When entering the data on the map the reference figures only need be used, such as, (1) 2,580,000, (2) 41 per cent, etc.

The maps may also be used to allocate to various territories the number of salesmen estimated to be necessary to handle the probable business. The routes of salesmen may also be shown with the dates when they are scheduled to arrive at and depart from various places along the routes.

Manufacture of Magnesia Cements

The colloidal magnesium oxychloride formed in cements of this type is protected from weathering by the addition of an insoluble lead soap, as a waterproofing colloid, maintained in a state of dispersion by casein or a similar agent. Soc. "Le Xylium" (B. P. 269,518, 2. 4. 27. Fr., 16. 4. 26). B. C. A.

Highway Congress Impresses Mexican Officials

The Second National Mexican Highway Congress and Exposition held in Mexico City came to an official close October 6, having been attended by more than 60,000 visitors and delegates from twelve countries. Approximately 250 engineers and machinery exhibitors, members of the American Road Builders' Association, were in attendance from the United States. President Compton, head of the Association, declared in his address that a Pan American Highway would attract more than a million American tourists annually. The Congress was held primarily to give impetus to Mexico's highway building program and to foster a Pan American Highway from Washington to Mexico City.

The first session of the Congress was opened by President-elect Emilio Portes Gil. The exposition was opened by President Plutarco Elias Calles and his cabinet. President Calles spent two hours inspecting the 130 exhibits brought from the United States demonstrating various phases of highway construction.

"The policy of the present administration in the Republic is to foster highway construction and it is my own personal belief that highways are an economic necessity for every nation and I shall do everything in my power towards the construction of a Pan American Highway." President-elect Gil declared, in opening the deliberations on Wednesday, "The completion of such a highway, permitting tourists from the United States to comfortably visit our country and our own people to visit the United States, would be of inestimable value and do much towards cementing a stronger bond of friendship between the two nations," he told the American delegates. Delegates left Mexico City October 13 after a two weeks' inspection of highways in Mexico under the auspices of the Pan American Division of the American Road Builders' Association.

Assurances that Mexico is anxious to cooperate with the United States in the completion of a Pan American Highway were given the delegates by President Plutarco Elias Calles and President-elect Emilio Portes Gil. "The budget for the current year," the delegates were told, "contains ten million pesos for highway construction." As a result of the Congress the Mexican government is planning to send a delegation to the January Convention of the American Road Builders' Association in Cleveland, the Mexican participation being in the nature of a continued effort in behalf of a Pan American Highway linking the two countries.

GENERAL MICA COMPANY BUILDS BUSINESS WITH BYPRODUCTS FROM CLAY PITS

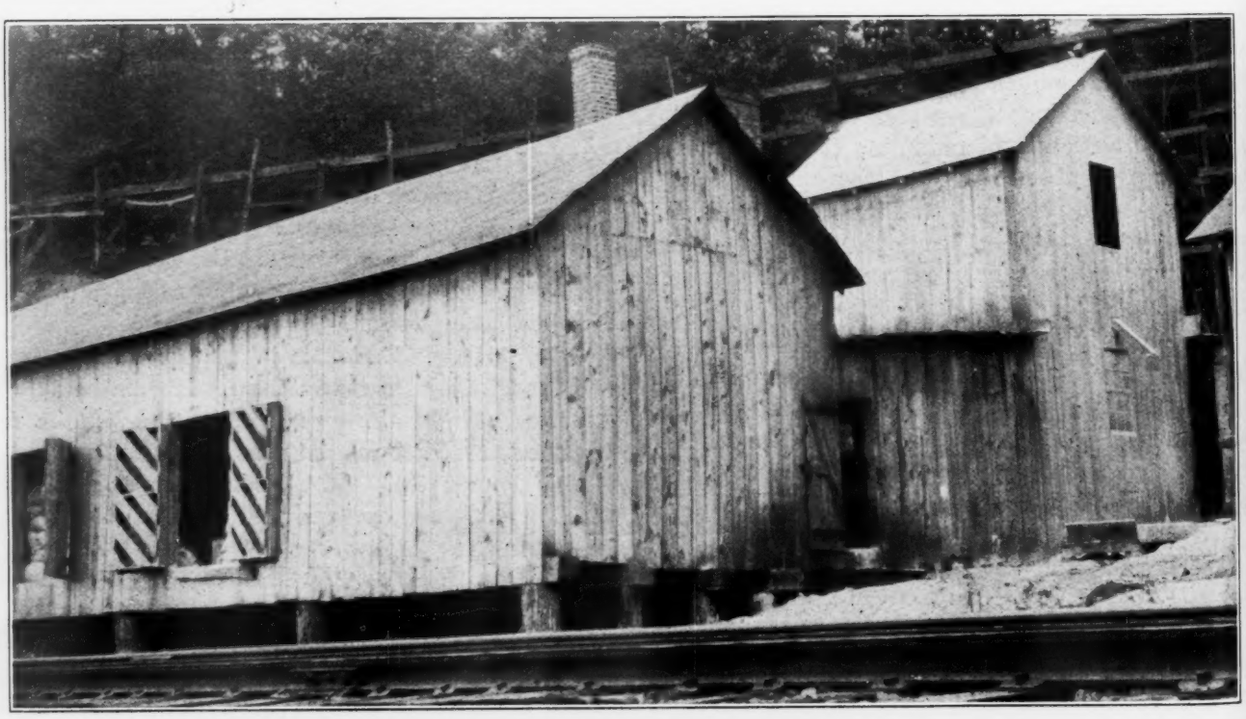
THE General Mica Company of Penland, North Carolina, is the outgrowth of a company which was formed several years ago for the purpose of recovering large amounts of mica that were annually being mixed with and lost in the waste materials cast aside by the clay companies, which operated in the Spruce Pine District of North Carolina. The mica deposit, being wasted, was freed by the decomposition of its confining rocks in the early ages of the history of the earth. Its sizes, ranging from small fragments to grains that will pass a 200 mesh screen, were mixed with the surrounding clay deposits. It was believed, and found to be true, that by taking advantage of the concentration of the waste material as it was released from the settling tanks of the clay products plants of the district, a profitable enterprise could be created although any attempt to wash the entire deposit for the mica alone was impossible as a profit making industry.

In 1925, the Flat Rock Mica Company was formed and a small plant for the recovery of this by-product was built. It conducted expensive and rather unsuccessful experiments for about two years, but was unable to show a sufficient profit to warrant more extensive operations. Others believe in the project and, in 1927, the General Mica Company was formed which absorbed the Flat Rock Mica Company, built a new concentrating plant and for the first time mica production on a large and profitable scale was begun.

After securing possession, the General Mica Company built its first unit, or concentrating plant, about 500 yards from the North Toe River near the Clinchfield Railroad between Penland and Spruce Pine, North Carolina. It is operated by a 15 h.p. General Electric motor using purchased power supplied by a public utilities company. Since the water from the clay washing plants was found insufficient to flush freely the entire length of the mica flow line, a centrifugal pump, manufactured by the Union Steam Pump Company, designed to deliver 200 gallons of water per minute, was installed at the river. This pump, which is driven by a 25 h.p. General Electric motor, forces a stream of water to a tank 200 feet above the river from where it flows by gravity to the concentrating plant to be used in fluming, washing and cleaning the mica.

The waste material from the clay plants is first flumed to the concentrating plant, where it is discharged into a receiving bin. It is taken from the bin by bucket elevators to a revolving screen for separating. The finer material that passes through the screen goes directly to a drag classifier, while the oversize passes to a 24 by 16 Sturtevant roll crusher. These crushing rolls crush the silica, waste clay and other materials, but have no effect on the mica.

This mixture, which was formerly the oversize, is taken again to the revolving screens for screening. The larger sized particles of mica pass into



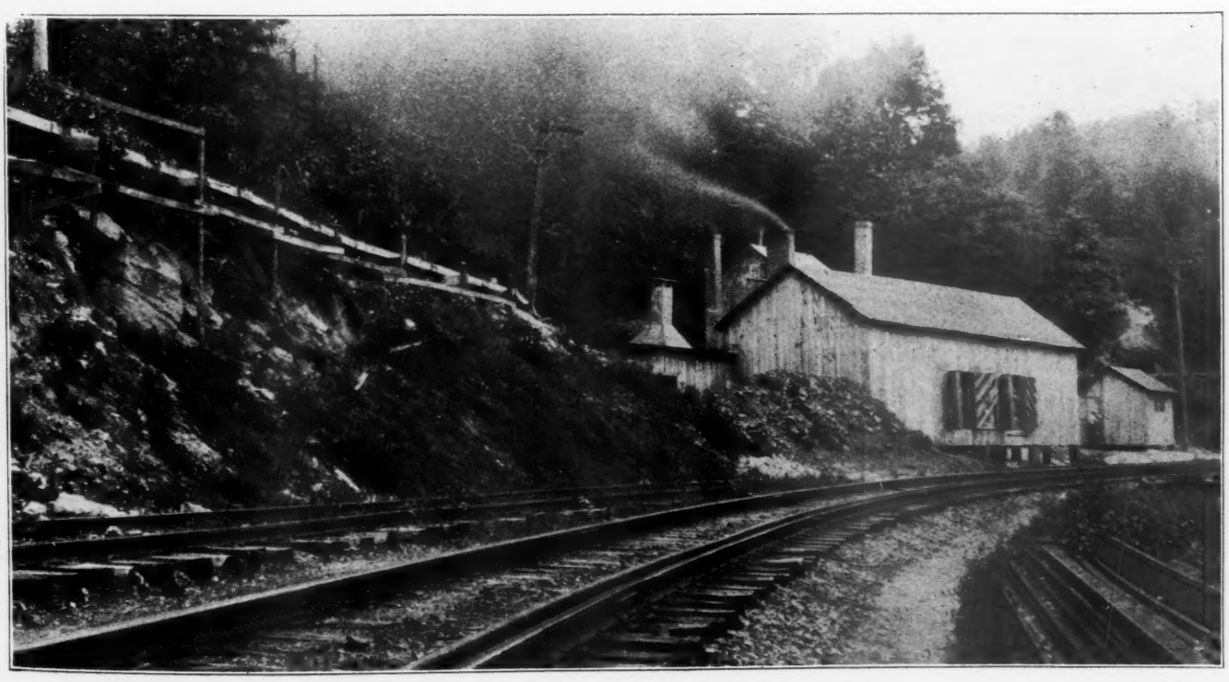
Rear View of Main Plant

Plant Number 2, the First Reclamation Plant for Mica in North Carolina

a bin for the purpose and the other material goes to the drag classifier. In this classifier, the clay, sand and other undesirable substances are removed and the mica is conveyed to the concentrating tables where the mica is finally refined. After the completion of the preliminary washing, crushing, screening and cleaning, the mica is flumed to the main plant, located along the railroad, where the final screening, sizing and drying is done. At this plant, the mica is settled in vats so arranged that when some are full, the flow can be directed into others and the first filled vats are emptied. The wet mica, which resembles putty, is shoveled from the vats and spread to an average depth of four or five inches over four dryers, 6 by 40 feet in size which are heated by a Dutch oven type of furnace.

In about 12 hours, the mica is thoroughly dried and is shoveled into the spaces between the dryers which are about two feet wide. In each of these spaces a screw conveyor has been placed. These conveyors take the mica to elevators, located at the end of the plant which elevate the material to the top of the plant and discharge it into a bin.

From this bin, it is taken by a mechanical feeder and discharged into a battery of Rotex screens where it is graded and sized. From these screens, the finished product goes to the bagger where it is bagged and stored in the warehouse to await shipping instructions and is loaded directly into railroad cars. The capacity of the finishing plant,



Main Screening and Drying Plant

Concentrating Plant for Receiving Waste Material

which is operated by a 10 h.p. General Electric motor, is from six to eight tons of refined mica per day.

Number 2 plant, as it is at present known, is the original experimental plant of the Flat Rock Mica Company and is located down the river from the main plant. It is used to take care of the extremely fine particles of mica that have passed through the clay settling tanks and down to the main clay plant. This plant, while much smaller, is similar in design and operation to the plant described. The mica, at Number 2, is raked from the dryers directly onto the screens, through which it is pressed by hand. Some of the mica is sufficiently fine to pass a 200 mesh screen. The capacity of the Number 2 plant is from 1,600 to 2,000 pounds per day.

Since the basis of these operations is the recovery of a by-product, the plants are economically operated and much of the equipment was designed and manufactured by the company. Officers of the company are Harry Baily, president; W. F. Deneen, vice president; and F. A. Swift, manager.

Waterproof Mortars

A "Hydrofuge" is a waterproofing agent to be intimately mixed with the mortar or cement or concrete before pouring. It must not alter the setting time, especially that of concrete, change the stability on storing, mode of working, strength after hardening or any other essential property of the mortar. Waterproofing agents may consist of "Alginise," Fucose , "Fucosalgue," "Aquabar," "Ceresite," "Wattproof," "Porolite," "Lithosite," "Castor," "Radicol" "999," "Amelma 100", etc., trade names for commercial preparations recommended by the author and in use in Europe. The use of a hydrofuge of good quality, responding to very high standards, gives certain results without producing fissure of the mortar. A truly efficient hydrofuge will occupy only the spaces between the usual small particles of the mortar, making the whole impervious without being merely applied on the surface.—L. Viennot, (Le Ciment, Sept. 1928.)

Public Utilities Increase Earnings

Earnings of public utilities in the first seven months this year are the highest on record. Gross operating income for the period is reported as $1,283,949,000, an increase of 23 per cent in four years. Net earnings are placed at $489,767,000, a gain of 37 per cent in the same space of time. This information is derived from a study of data of the U. S. Commerce Department. Gross earnings of the utility companies in the first seven earnings of the utility companies in the first seven months last year were $1,226,316,000, it is shown. In 1926 they were $1,147,828,000, and in 1925 they were $1,043,648,000. Net profits amounted to $445,317,000 in 1927, compared with $408,631,000 in 1926 and $357,326,000 in 1925.

The percentage of net to gross for the seven-month period shows a steady increase each year since 1925. In 1926 it rose to 35.6 per cent, and 1927 to 36.3 per cent. This year a further increase to 38.1 per cent is revealed.

SERIES OF PLANTS PROVE ECONOMICAL TO SOWERBUTT BROTHERS

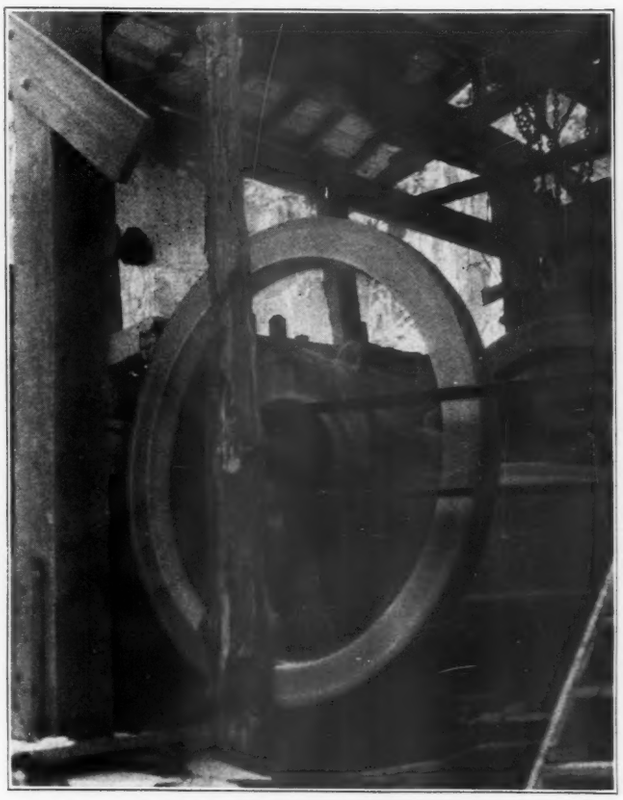
By F. A. Westbrook

SOWERBUTT BROTHERS of Haledon, N. J., have a very interesting plant, or rather series of plants, which include the production of trap rock, batch mixing, an asphalt plant and a sand pit. In this way the Company can produce all its own material for road work. Business has been exceedingly good this year and there is a constant stream of trucks, mostly belonging to contractors, entering and leaving the plant. Haledon is a suburb of Paterson, in which vicinity there seems to be an insatiable demand for sand, gravel and crushed stone, as is attested by the activity of all producers serving the district.

The quarry has a high face which reaches 150 feet at the highest points. It is almost surrounded by a first class residential district so that heavy blasting is out of the question. Consequently they drill in benches, using Chicago Pneumatic drills.

Stone is picked up at the bottom with a Marion electric shovel and loaded into Autocar trucks, of which there are two, which carry it to the primary breaker. All of the machinery in the crushing plant was supplied by Earle C. Bacon, Inc., and its installation was largely supervised by them.

The quarry trucks dump the stone into a 36x42 Farrel jaw crusher, whence it is conveyed by a 30 inch Bacon conveyor to the Bacon revolving scalping screen. Tailings from this screen drop to the secondary crusher, which is an 18 by 36 Farrel, and then on a Bacon belt conveyor to the second Bacon revolving scalping screen. The throughs



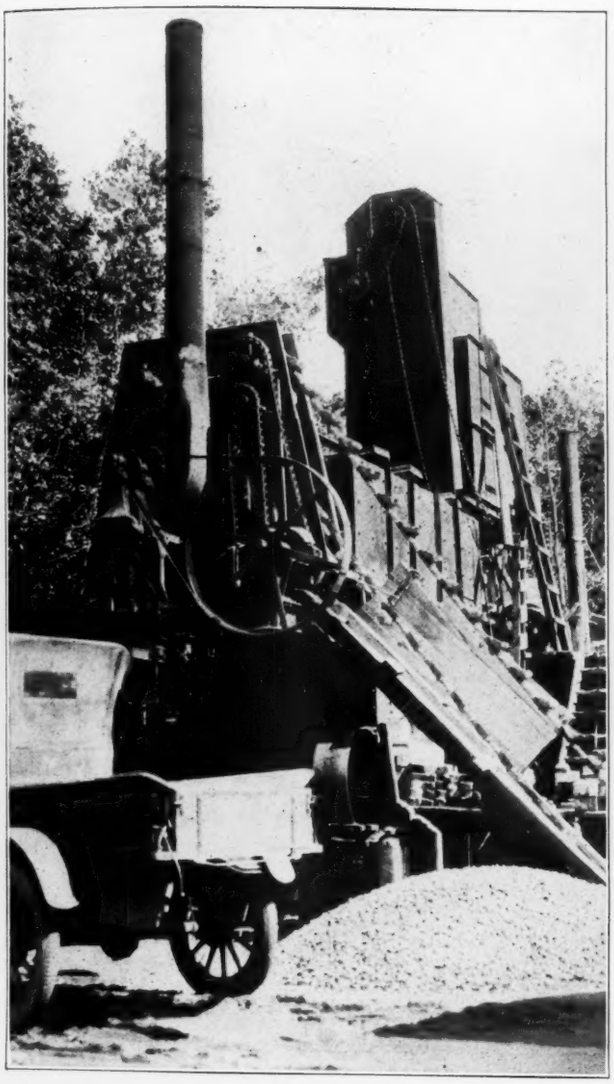
Primary Crusher

Truck Dumping into Primary Crusher

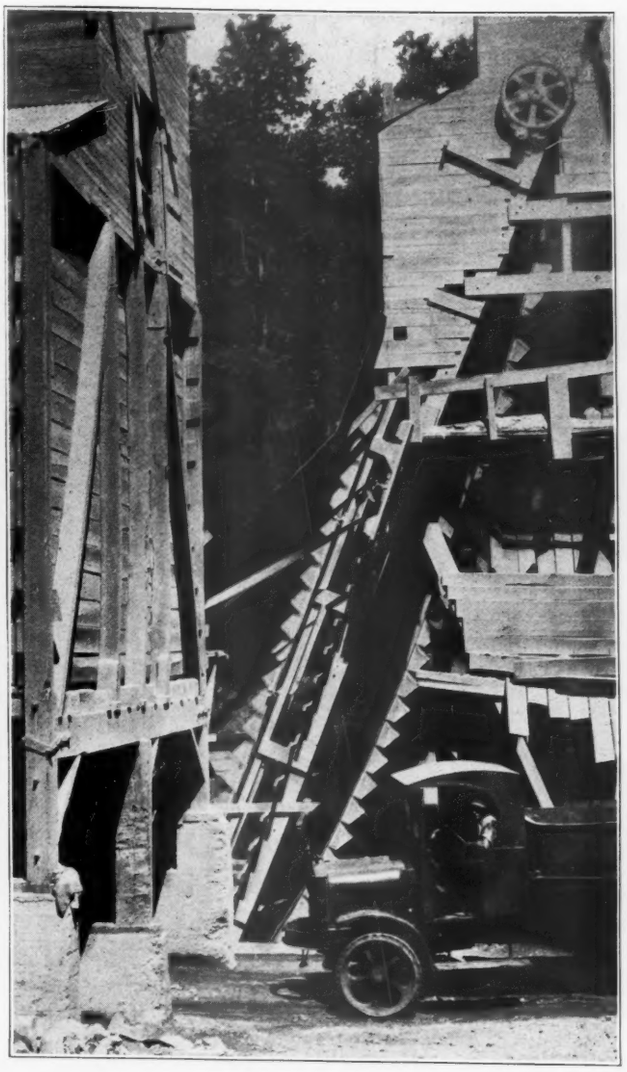
Batch Mixer

Recrushing 2½ Inch Stone

Shovel Loading Truck at Face of Quarry

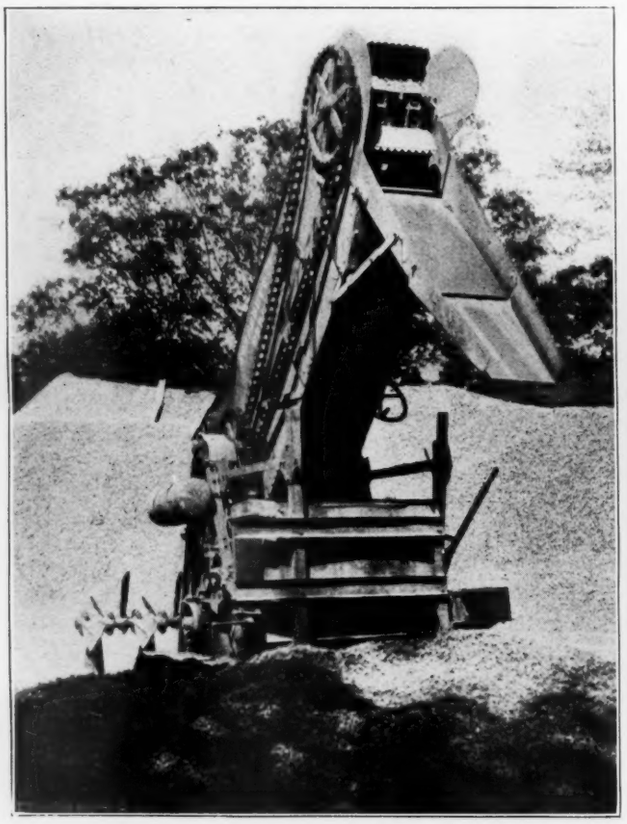


Asphalt Plant



Elevator to Screen

Conveyor from Primary to Secondary Crusher



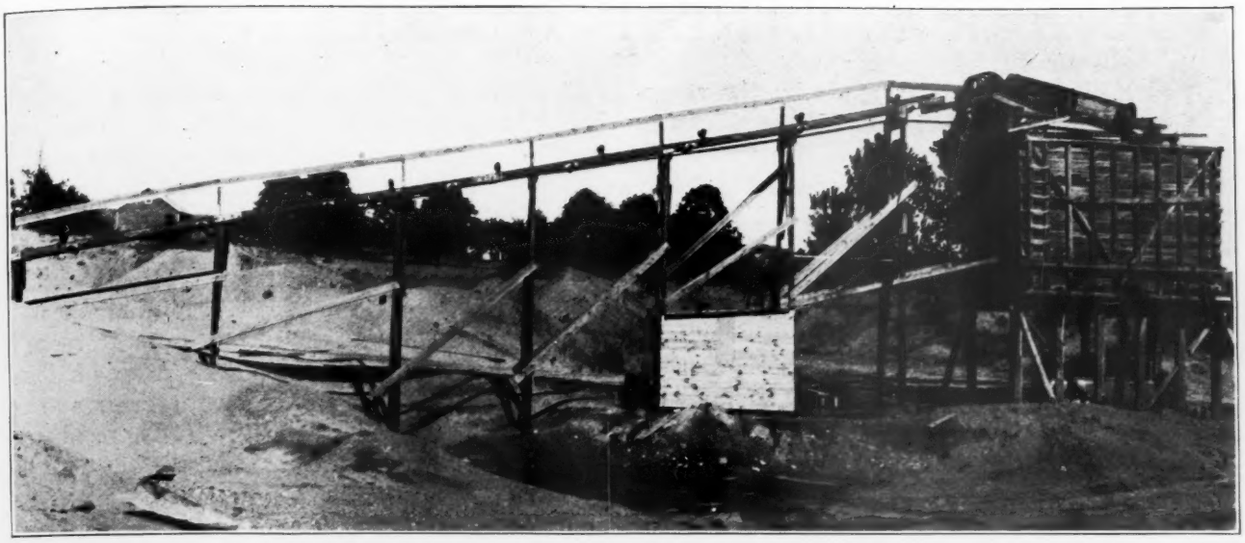
Loader at Stock Pile

Breast of Quarry

from both scalping screens are carried on the same belt conveyor to the Bacon sizing screen. The rejections from the second scalping screen drop into another 15 by 36 Farrel crusher and after crushing pass back to the scalping screen by an elevator.

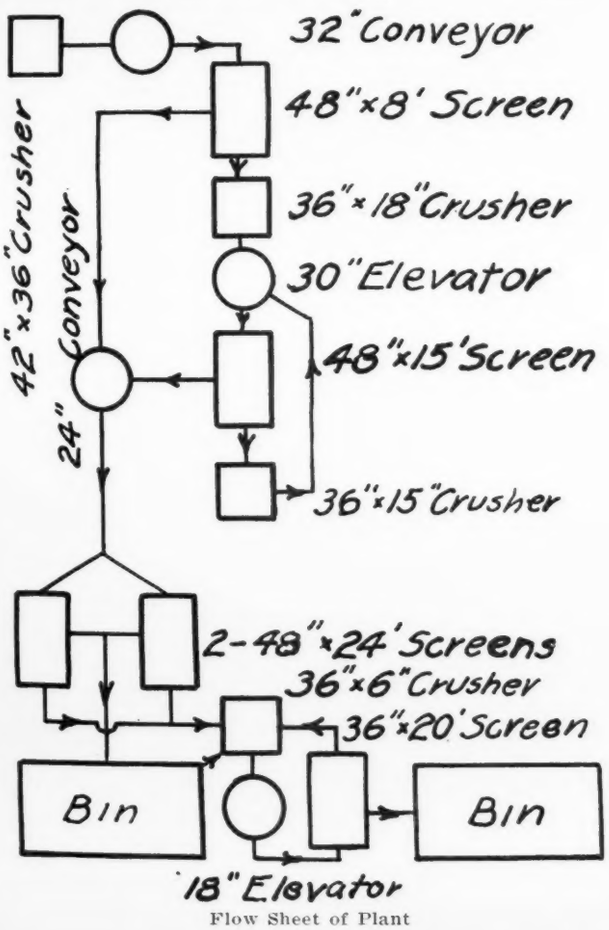
As the demand for the 2½ inch size is small, most of it is recrushed in a separate department. That is,

Loading Truck in Sand Pit



Screening Plant in Sand Pit

the stone passes through a chute from the 2½ inch bin to a 6 by 36 inch Farrel crusher and is then elevated to a sizing screen over a series of bins. The rejections from the screen come back to the crusher. Of course, this was a later addition to the plant and was installed as a separate unit when it became necessary to recrush so much of the 2½ inch size. It seems possible that this falling off of the demand for the largest size may lead eventually to modifications in the design of new plants, as already provision in many existing plants has had to be made to accomplish this result.



Flow Sheet of Plant

A Blaw-Knox batch mixer has been installed and a Cummer asphalt plant, both shown among the illustrations. Loading of trucks from stock piles is accomplished with a Barber Greene and a Haiss loader. All shipments are made by truck so that adequate loading machinery is an important item. The company owns several White trucks, but the bulk of the shipments made are in hired trucks or in contractors' trucks.

The company also has its own sand pit in Upper Preakness, about two miles away. The property comprises 24 acres. The bank is worked by an Orton gasoline engine driven crane, which up to the present has loaded directly into trucks. Now, however, a screening plant is being installed. There is to be a drag line scraper with a Bacon belt conveyor to the Bacon screen with bins below from which trucks may be loaded.

The sand found in this deposit is clean and good for concrete work and asphalt. A good deal of it is taken to the asphalt plant at the quarry and quantities of it are sold to contractors.

Uses of Silica

Silica occurs in deposits of commercial importance in many different forms, such as vein quartz, as a constituent of pegmatites, as sand, sandstone, quartzite, or flint, as tripoli, and as diatomite or diatomaceous earth. In some forms, such as rose, smoky, and amethystine quartz, it has value as gems. A statistical report on the production of silica in 1927, just published by the United States Bureau of Mines, Department of Commerce, deals with silica of all kinds except gem quartz, silica sand or sandstone used for making glass, and silica used in the form of sand, gravel, and crushed material for building, for concrete and mortar, for foundry and furnace work, and for cutting and grinding stone.

FEWER ACCIDENTS IN QUARRIES IN 1927

MARKED progress was made by the stone-quarrying industry in the United States in the reduction of fatal accidents among its employes in 1927, according to reports furnished by operating companies to the United States Bureau of Mines, Department of Commerce. The death rate from accidents was lower than ever before, with the single exception of the year 1924, in which year the death rate was the same as that for 1927. The nonfatal injury rate, covering all "lost-time" injuries, was slightly higher than in the preceding year but it was lower than in any other year since 1920. The number of men employed at the quarries and the number of shifts worked by them were substantially the same as in 1926. The average employe worked the same number of days in 1927 as in the year before.

Reports from the operators showed 91,517 men employed in the calendar year 1927, who worked 24,782,561 man-days, an average of 271 work days per man. One hundred and thirty-five deaths and 13,459 injuries from accidents were reported. As compared with 1926 these figures showed an increase of 371 employes, 74,161 shifts, and 258 injuries. There was a decrease of 19 in the number of fatalities. Accidents during the year represented a death rate of 1.63 and an injury rate of 162.92 per thousand 300-day workers as compared with a death rate of 1.87 and an injury rate of 160.28 in 1926.

Operations inside the quarry pits employed 49,549 men who worked 12,426,312 days, an average of 251 days per man. Accidents to these employes killed 99 men and injured 8,015, resulting in a fatality rate of 2.39 and an injury rate of 193.50. In the year 1926 the reports show 50,620 men, employed inside the quarry, who worked 12,812,387 shifts, an average of 253 days per man. There were 110 deaths and 8,006 injuries in 1926 with corresponding rates per thousand 300-day workers of 2.58 and 187.46, respectively. All of the figures indicate a decrease for the year 1927 with the exception of the number injured and its corresponding rate.

"Outside" the quarries at crushers, mills, rock-dressing plants, etc., the employes numbered 41,968, an increase of 1,442; 12,356,249 man-days, an increase of 460,236. The average work days per man was 294 for both 1927 and 1926. While the fatalities decreased from 44 in 1926 to 36 in 1927, with the fatality rates decreasing from 1.11 to 0.87, the non-fatal injuries increased from 5,195 (with a rate per thousand employed of 131.01) to 5,444 and a rate of 132.17.

Quarries are classified by the Bureau of Mines according to the kind of rock produced, as follows: Cement rock, granite, limestone, marble, sandstone and bluestone, slate, and trap rock. The cement-rock quarries showed a slight increase in the number of men employed, as did granite, limestone, marble, and trap rock. The average days worked by the cement men was less than in 1926, and there was also a decrease in the aggregate number of shifts worked by the employes. The number of shifts worked at slate quarries and the number worked at sandstone and bluestone quarries were less than in 1926; and there was also a decrease in the number of men employed. There was a sharp decline in both the number of fatalities and injuries in the cement plants in 1927 as compared with the previous year; the reports for the other quarries showed little differences between the two years, 1926 and 1927.

The principal causes of accidents inside the quarries were handling rock at the face, flying objects, falls or slides of rock or overburden, haulage, and machinery. Accidents at outside plants were due mainly to flying objects, machinery, falling objects, haulage, and hand tools.

Organize Gypsum Institute

For a number of months the gypsum industry has been in an unsatisfactory condition. Although building construction has kept up well in comparison with 1927, the prices of gypsum products have steadily declined in 1928 so that today gypsum products are being offered at or below cost.

Recognizing the need of cooperation, certain gypsum manufacturers met at the Hotel Commodore in New York City on August 2nd and 3rd and organized the Gypsum Institute. This organization will take over the properties of The Gypsum Industries, Incorporated, which suspended activities on May 1st and will function in much the same manner and with some of the same personnel as the old association. Already a headquarters office and a traffic department have been opened at 110 West 40th Street, New York City.

Meetings will be held each month, and it is hoped that within a relatively short time definite progress will be made toward improving the present deplorable conditions.

The following officers of the Gypsum Institute were elected at the August meeting: President, James Leenhouts, vice president and general manager of the Grand Rapids Plaster Company, Grand Rapids, Michigan; first vice president, Eugene Holland, president of the Universal Gypsum and Lime Company, Chicago, Illinois; second vice president, L. I. Neale, sales manager of the Atlantic Gypsum Products Co. of New York, N. Y.; secretary and treasurer, W. J. Fitzgerald, New York; other members of the board of directors, F. G. Ebsary, president of the Ebsary Gypsum Company, Scottsville, N. Y., and J. F. Haggerty.

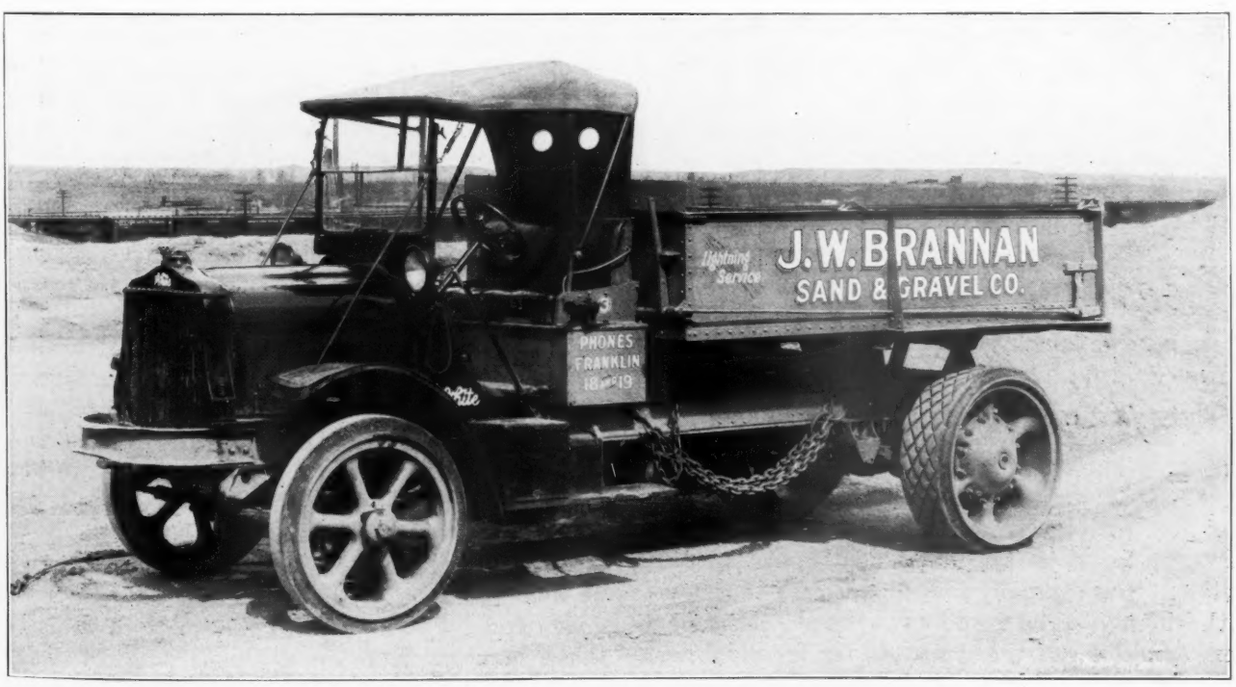
J. W. BRANNAN SAND AND GRAVEL COMPANY USES TRUCK DISPATCHING SYSTEM

FIVE years ago the J. W. Brannan Sand and Gravel Company, of Denver, Colorado, was operating one pit and did not own a motor truck—all delivery of sand and gravel being made by trucks hired for the purpose on a yard-mileage basis. Today, the company is operating nine pits, has a fleet of 15 five ton trucks and hires 35 more and is conducting the delivery system on a "train dispatching" system which reduces haulage costs by eliminating long trips back to the pit empty.

Well organized taxi-cab concerns have stations in various parts of the city with telephone connections with the main office. To these stations the drivers report after completing a fare. They report to the nearest station where they phone the main office of their whereabouts and remain there until orders are received from headquarters unless a passenger hails them. Should a call for a taxi come in the office telephones the station nearest to the location of the prospective customer. This saves empty mileage.

The dispatching system of the Brannan company is similar but the pits are the stations and the truck drivers report to the nearest pit for the next order. But the system differs somewhat from the taxi business inasmuch as the driver gets his orders as to which pit he shall report to before he leaves with his load from one pit. These pits are located at strategic points on the outskirts of the city so that "Lightning Service" in the delivery of material is possible. When the driver leaves one pit with a load, he is told to report to another pit to pick up his next load, and in the course of a busy day when orders for sand or gravel are coming from all directions, it is frequently the case that numerous trucks have visited all of the pits in their efforts to cut down the number of miles they travel without loads. To better explain the system, let us suppose that a driver leaves a pit on the east side of town with a load to be delivered somewhere in the center of town, and there is a call in for a load of sand to be delivered to an address west of the center of town and nearer to a pit on the west side. The driver is instructed to deliver his load of sand in the center of town, go to the west side pit, pick up a load of sand and deliver it to the address which is somewhere between the center of town and the west side pit. See how much time this saves. On his arrival at the west side pit he receives orders as to which pit to go to when he has concluded his second load. All of this dispatching is conducted from the main office at 48th and Gilpin Streets and one man does nothing else but route the fifty trucks all day long and sometimes late into the night.

Perhaps you may wonder at the efficiency of this plan over that of maintaining a fleet of trucks at each pit and zoning the city so that each pit and its fleet of trucks will take care of all orders coming in from its respective zone. In some lines of business such a system might work out, but in the sand and gravel business, there are larger orders requiring hundreds of yards of sand and gravel and small orders for a yard or two. The small



One of the Trucks Being Used

order may come in from one part of town and the large order be from another section. Most of these small orders are rush orders and while there may be a dozen or more trucks working on each of several large orders going on at the same time, the little fellow must be supplied and it is necessary to concentrate the fleet onto the big orders and shoot one or two from the main fleet to handle the small orders. If the orders were few and far between, then such an elaborate system of dispatching trucks would not be necessary but this firm has some 1,500 customers, not all of whom are needing sand or gravel each day, but when they want it they want it in a hurry.

The company supplies, according to Mr. F. P. Spratlen, secretary and treasurer, from 80 to 90 per cent of all of the sand and gravel for building purposes in the city and all because of the Lightning Service promised and religiously adhered to by the firm. It is not infrequent that a load of material is on the ground before the contractor gets back from telephoning his order. That seems ridiculous, until you stop to figure that on some jobs the contractor is far from a telephone. He motors down to the nearest phone, sends in his order and then leisurely motors back to the job. The Brannan company may have had a truck handy at the pit nearest to the job, and since the loading is done by conveyors, it does not take long to load up and get underway, beating the contractor back to his job.

Several instances there are when delivery within an hour is desired by a contractor and he's never disappointed. The home gardener who wants a load of sand to fix up his driveway, phones in and says he wants a load right away quick so he can fix up his driveway that afternoon. He'll get it when he wants it and then he wonders how the company does it because he knows the main office and Pit No. One are six or seven miles from his place.

This lightning service and dispatching system is the secret of the success of the truck fleet. As I have previously stated the company owns but fifteen trucks of its own—the remaining 35 are owned by the men who drive them. But all of the trucks are of one make, equipped with the same kind of a dump body and many of them are bearing the Brannan company's name. A man who is hiring himself and his truck to the Brannan company is certain of making big money and practically every one of these truck owners did not own a truck before they started hauling for the Brannan company. They wanted a job but the firm requested that they get a truck of a certain make and if necessary pay for it on the installment plan. In some instances the company loaned the men the money with which to make the down payment. These men were employees of the company, for the most part, and driving company trucks before they were seized with the desire to own a truck of their own. As an example of how profitable the opportunity is for a truck owner, it is said that one man averages around $1,000 a month. One month he took in more than $1,300. Out of that, of course, he must pay for the repairs on his truck, gas and oil, depreciation and other expenses incident to owning and operating a truck. Even at that he cleared a nice salary for the month. It is because of this dispatching system and the operation of nine pits instead of one or two, that the truck owners are able to make so much money, because they do not have to travel far without a load. Each one of the truck owners is an expert mechanic and is capable of servicing his own truck, making some major repairs and all the minor ones, which ability naturally reduces the cost of operation.

But why standardize on one particular make of truck? Why not permit truck owners to operate any sort of truck they may see fit?

The company's own fleet of fifteen trucks is in reality an emergency fleet made obviously necessary through a strike of truck owners about five years ago when the company had no trucks of their own and when the truck owners formed a union and demanded a higher price for their services. There were many features of the truck owners demands that were unreasonable, according to Mr. Brannan, so he determined to build up a truck fleet that would remove similar difficulties in the future. He figured that fifteen trucks of his own would care for emergency business by working them night and day, and then he would not be at the mercy of outside help. He determined to build up, with this fifteen truck fleet as a nucleus, an auxiliary fleet of truck owners who would be loyal to him and likely to be available when additional trucks were necessary.

In looking over the records of remuneration to truck owners on the previous system, he picked out the records of those owners who had been making a good living on the scale then in effect and he discovered that these men were using a certain make of truck. Also he noted that they were the most cheerful of the entire bunch and less disgruntled over the remuneration. He bought trucks of that make for his own fleet.

It must be remembered that at that time, he did not have but a fraction of the amount of business he now has and his own fleet could handle a goodly share of the business. He instituted the "Lightning Service" idea, bought more pits and business increased. He was careful in picking truck owners, as the business demanded additional equipment, and selected only those men in whom he had confidence in their loyalty. He wanted these men to be able to make good money and he felt that a good truck was necessary, not only in assisting these men to make money, but also to insure prompt delivery. He wasn't in favor of half re-

paired equipment, partially rebuilt trucks and drivers who were not capable of repairing their own trucks. He was satisfied with the operation of his own trucks and felt that other trucks of the same make would give equal service to the individuals who were working on the yard-mile basis. Furthermore there was the advertising value of having all trucks delivering Brannan Sand and gravel, of the same design and appearance, and, since many of those trucks would be in constant service, they might bear the company name and uphold the company's business policy. Therefore when a man wanted to work for him as a truck owner Brannan insisted that he use a truck which was like his own and even staked some of the men to sufficient money to make down payments on new trucks. In the great majority of such cases the men were employees of the company and had been operating company trucks. As fast as business increased additional trucks were hired but hired only upon the certainty that the Brannan company would have sufficient work to keep them busy most of the time.

Owing to the peculiar climatic conditions in Denver, building operations continue almost twelve months in the year, so that the demand for building material usually is good and there are seldom more than two months in the year when the truck owners find themselves with time on their hands. But owing to the reputation these truck owners have gained for themselves among contractors, they find plenty to do in these two months by working for excavation contractors who are preparing the excavations for new buildings to be erected the following spring and summer, so it is almost a twelve month a year job these truck owners have.

Truck appearance is a factor in upholding the company's service, so all trucks must be washed twice a week—rather unusual for this sort of business. All of them are painted a battleship grey. The lettering is in black and the slogan "Lightning Service" in printed in black letters with the zig-zag lines representing a bolt of lightning, being put on in gold leaf with a trimming of red. A feature that has caused much comment, and therefore considerable advertising, is the request printed on the rear of the truck body. It is "Please Report Any Discourtesies."

Living Costs Compared

Living costs in the United States are more favorable to the consumer than in many foreign lands by comparison with prices which prevailed before the war, data compiled by the U. S. Labor Department indicated. The present cost-of-living scale in this country stands at approximately 70 per cent above that of 1913, it is shown. In Switzerland and England the levels are slightly lower, being placed at 60 per cent above pre-war, respectively.

The people of Ireland are reported to be relatively in about the same position as those of the United States, their necessaries having increased 70 per cent in price. In Australia costs are up 75 per cent, in Norway 96 per cent, and in Belgium 104 per cent. Still heavier increases are seen in France, 407 per cent, and in Italy 426 per cent.

In many countries the rise in living costs has been found to be wholly or partly offset by corresponding increases in wages, salaries and income from other sources. That this is true in a greater degree of the United States than of most nations is generally conceded.

Nature and Uses of Fluorspar

Fluorspar, or fluorite, is a non-metallic crystalline mineral that usually occurs in glassy, transparent isometric crystals, largely cubic, or in cleavable masses. Less commonly it has a granular or fibrous structure, and occasionally it is banded. Fluorspar has a specific gravity of 3.2, is brittle, has a hardness of 4, and can easily be scratched with a knife. Fluorspar is a mineral of many colors, ranging from clear, colorless, or slightly bluish, and glasslike, through various striking hues, of which purple and green are most common; much of it is white and opaque. Chemically it consists of calcium and fluorine in the proportion of 51.1 to 48.9.

Fluorspar has many uses, but its most important use is in the manufacture of steel by the basic open-hearth process, says the United States Bureau of Mines, in the statistical report on production of fluorspar and cryolite in 1927. It is also used in the manufacture of alloy steel and ferroalloys by the electric-furnace process, and in some foundry and other metallurgical operations.

Fluorspar is used in considerable quantities in the glass industry, chiefly for the manufacture of opal or opaque and colored glass; as an ingredient in enamels for various purposes; and in the manufacture of cement, in which it is said that the addition of fluorspar to the raw materials permits the lowering of the fusing point, resulting in considerable economy in fuel, as well as an economy in power, because the clinker obtained is fragile and therefore more easily ground.

Fluorspar is the basic material used in the manufacture of hydrofluoric acid. It is also said to be used to facilitate the fusion and contact of ingredients in the manufacture of calcium carbide and cyanamid.

A very small quantity of clear fluorspar crystals is used for optical purposes; fluorspar is useful in correcting the color and spherical aberration errors in lenses.

Airport Installs Pavement for Planes

Paved runways, permanent, fire-safe buildings and complete facilities for the efficient handling of passengers, mail and express are combined in one airport for the first time in the history of American aviation. The airport is Ford's, located at Dearborn, eight miles west of the heart of Detroit, on a paved highway.

More than 30,000 passengers have passed through the splendidly equipped airport passenger station thus far this year, to take the air in the fleet of Ford tri-motored metal planes operated by the Stout Air Services, chief users of the port for passenger service. In addition, the Ford company's own planes have been constantly on the move, carrying mail and freight to Chicago, Cleveland and Buffalo. The big ships have made more than 10,000 take-offs and landings at the port, since its opening three years ago; smaller planes use the facilities of the field frequently, with the result that the Ford port is one of the busiest in the world.

A feature of the port which makes it particularly popular with pilots of heavy planes is the system of paved runways, which is unique in America. A strip of concrete pavement 1600 feet long and 75 feet wide, augmented by a shorter strip of non-rigid pavement, gives planes facilities for take-off in two directions. Another such concrete pavement, 3000 feet long, is to be constructed; so take-offs and landings may be made in any of four points of the compass.

Stanley Knauss, general manager, Stout Air Service, Inc., reports that his pilots are enthusiastic about the new runways, particularly for taking off.

"The take-off from the smooth, uniform surface," says Knauss, "is always positive. The pilot knows that the plane lifts off only when it has attained flying speed, for there are no bumps or ruts to bounce the plane into the air in 'false' take-offs."

Landing on the paved runways is made feasible by the substitution of a wheel for the usual tail skid and by the use of brakes on the landing gear wheels.

Ford port equipment consists of a huge, heated hangar capable of housing many planes, large and small, a smaller hangar, a storage house for parts and motors, a factory where the big ships are produced at the rate of three a week, and the passenger station. Concrete warming-up strips are provided in front of the main hangar and all buildings are connected by paved drives and walks.

Although the Ford port is unique in its class, ports in other cities may soon rival it. St. Louis, Tulsa, Philadelphia, Detroit, and New York are planning similar plants with an even greater equipment of paved runways.

Cement Statistics for September

The ratio of the operations to the capacity of the American portland cement industry during the month of September was 91.7 per cent, according to figures recently released by the Bureau of Mines of the Department of Commerce. During the month 17,856,000 barrels were produced, 20,462,000 barrels were shipped, and there were in stock on hand at the end of the month 16,722,000 barrels. Production in September, 1928, was 2.0 per cent more, and shipments 3.2 per cent more than in September, 1927. Stocks at the mills were 19.5 per cent higher than a year ago.

Building Association Assets

Building and loan associations in the United States now have assets totaling approximately $7,179,000,000, according to the latest information received by the Comptroller of the Currency. This is an increase of $844,459,000 over the amount reported for the previous year. The data for both years were reported by the U. S. League of Local Building and Loan Associations. The building associations operate to some extent in every state, it is indicated. Pennsylvania is reported to lead all other states in aggregate assets of associations with a total of approximately $1,246,000,000. Ohio ranks second with $1,035,000,000; New Jersey with $886,000,000 is third, and Massachusetts, $478,000,000, fourth. Other states in which the associations are shown to be well financed are Illinois, with $388,000,000 in assets; New York, with $350,000,000; Indiana, $274,000,000; California, $242,000,000; Wisconsin, $218,000,000, and Maryland, $210,000,000.

The building associations with their large accumulations of capital are held to constitute an important agency for promoting home ownership, particularly among individuals and families of moderate means. A large percentage of the funds loaned, it is stated, go to finance construction of this type.

Rotary (Cement, Etc.) Kiln

The tapered blocks or bricks forming the lining of a rotary kiln for burning portland cement, lime, soda, etc. are provided with a recess along one of the edges of the wide end, and a corresponding projection at the opposite edge of the same end. The bricks thus lock together at the outside, and are prevented from falling into the kiln even when badly eaten away. F. Hurlbutt (B. P. 293,331, 24. 3. 27). B. C. A.

PUTTING SAFETY ACROSS IN THE CEMENT PLANT

By J. R. Cline, Universal Portland Cement Co.

"PUTTING Safety Across in the Cement Plant" could be better discussed by someone from any of the 34 plants that have gone without a lost time accident for the first eight months of this year; for at the plant where I work there have been only two lost time accidents this year, the same number that occurred last year. Our best record is a period of 369 days without a lost time accident from October 10, 1926, to October 15, 1927.

Never having had a perfect year in safety, it would be better to change the subject of this paper to "How We Try to Put Across Safety in the Cement Plant." The first requisite needed is to have superiors who are vitally interested in safety, higher-ups whose first question is not, "How much clinker have we produced?" or "How much cement have we shipped?"—but "How is our accident record? Are we still free of lost time accidents?"

The first thing done in our plant was the guarding of every known hazardous place. Substantial guards were put on gears, shafts, pits, stairways, ladders and railings, and additional ones are being installed on new places constantly brought to our attention. Guards once placed must be maintained in perfect condition, as they may shake loose, wear out or be broken. If not maintained they become a hazard instead of a safeguard.

After guarding the dangerous places the next thing done was the maintaining of a number of bulletin boards in conspicuous places, with the changing of bulletins at least once a week, to teach by word or picture the sources of danger that constantly surround all employees, and to maintain interest in this source of display.

One feature display in our bulletin boards is a calendar for each department and one for the entire plant, showing for each day of the corresponding month of the previous year the number of accidents, trivial, lost time, eye, or a clean slate, as the case may be, that occurred during that month and the record right up to date of the current month. The figures for the previous day are placed the first thing in the morning and create a lot of interest.

Cleanliness of the plant property is essential. All dirt cleaned up, scrap properly disposed of, passageways properly marked and kept free of obstructions, building maintained in proper repair and grounds kept clean and provided with grass plots and trees to make the general surroundings more pleasant to work in.

Proper lighting is essential for both day and night. Windows and openings should be kept clean to allow all the daylight possible to enter, as no light is superior to daylight for general working conditions. For night lighting plenty of electric lights should be at all points in and about the mill so the hazards of darkness cannot exist. Numerous places for plugging in extension lines should be accessible over the plant so there will be no excuse for a man not having proper light to do any work required.

All the things mentioned so far have been physical necessities to put across safety in the cement plant. They are all essential and should be maintained to the highest point of efficiency, but there is still another phase that is far more important. This phase is the education of employees in the safe method of working and getting their cooperation to apply these safe methods at all times so they do not get hurt or hurt someone else.

This we have accomplished best by holding group meetings and getting the suggestions of the men present at these meetings and, as far as possible, carrying out their suggestions.

Our system is to have each department in its subdivisions hold meetings. Foremen usually preside and seldom over twenty men constitute the group present. Items of interest are brought up and any accidents that have occurred, or are known about, are discussed. The Portland Cement Association report on "Significant Accidents" is read at these meetings, as well as the report of any accidents that have occurred at any of the other plants of our company. Suggestions are asked for and as many as sixty suggestions have been received from one of these meetings. We insist that each department hold enough of these meetings so that each man in the department attends at least one of these meetings each month.

A general safety committee composed of all foremen meets once a week to discuss safety problems. Here any suggestions brought up at the group safety meetings that cannot be taken care of in the regular routine of operation, are discussed and decision made as to their disposal.

A special group of selected men known as safety officers, about one for each twenty employees in the mill, meets, one-third of them, each week so each turn has its representation, and I talk to them concerning safety and any items of general interest that should be brought up at the time. Items they have to report are listed and answers made to any questions they or anyone in the group they represent send in concerning why something has or has not been done in the interest of safety. In addition to mill safety, stress is placed on com-

munity safety and no meeting is ever adjourned without the request for each member to "Take Their Safety Home."

Safety is also discussed at the superintendent's meeting. A chart is always on display at this meeting showing the number of accidents, trivial or lost time that have occurred in each department for the previous week and the subject is regularly discussed at its proper time.

Each item reported at any of these meetings is written up on a form provided for that purpose. This form is made in triplicate, the original for the assistant superintendent's office, second copy given by head of department receiving it to workman who signs it on completion of job and returns it to his head of department and returned to assistant superintendent, who has it filed as a record of job completed.

An idea of the number of items reported at the various meetings is obtained when I say that 2,125 were written up for 1927—89.6 per cent were completed, and this year items were reported at the rate of 2,500 for the year.

In addition to the various meetings, with their groups constantly reporting items to be taken care of, a special committee of picked men is assigned to the job of making a thorough inspection of the entire plant each spring and fall; they report on conditions affecting safety, cleanliness, structural conditions, painting and, in fact, everything that is necessary or will improve the safe operation of the plant. Usually three days is required for this committee to complete its inspection and its reports have sometimes had three hundred items.

Other things we feel have a bearing on safety are good locker rooms; periodic physical examination of all employees in addition to physical examination of applicants; a nurse on duty every day who investigates all cases of employees reported off account of sickness and does considerable community welfare nursing; a doctor who spends one hour each day at the emergency hospital and is subject to call any hour of the twenty-four, all in addition to a well equipped first aid hospital that is completely manned at all times.

To maintain interest in safety we try to have our employees attend safety schools and safety lecture courses whenever possible. Several schools are run by the Western Pennsylvania Division of the National Safety Council, at Pittsburgh, about fifteen miles from the plant. We post the schedule of the meetings and with a little personal advertising are able to get about twenty employees to regularly attend these Pittsburgh meetings. For the last couple of years there has been a group of meetings held at New Kensington, about 10 miles distant from our plant. We made a special drive for these meetings and provided bus transportation for those not having their own cars who were willing to go. For the seven meetings held last year we had a total attendance of 2,150—average attendance 307—maximum 386—and a total of 697 employees attended one or more meetings—233 attended the banquet and 211 received diplomas for attending at least five of the seven meetings.

This year we intend to hold a series of meetings at Universal. The number of our employees willing to attend a safety lecture course of this type has become so great that we can better arrange to bring the lecturers and entertainers needed to them than to safely transport the great number to other community meetings. We also feel that by holding a set of safety meetings in our own town we will better promote safety throughout the entire community.

We have had over 50 present at each of the meetings and dinners of the Portland Cement Association Regional Safety Meetings held in Pittsburgh the last two years. A representative of our plant has been present at the last four National Safety Congresses and has also attended the Portland Cement Association Regional Safety Meetings held in Allentown and state meetings held in Philadelphia for the last two years.

For the promotion of safety in the community we have each year interested all local organizations in the November Thanksgiving No-Accident drive, and have distributed great numbers of posters for conspicuous display and have seen that each school child in the district has a small picture of the general poster with an explanation of the purpose of the drive given by the teacher or someone from our organization. Occasionally we go through our files and pick out any safety posters that we think would be of use to school children and give them to the teachers to distribute or use in any way they desire to supplement their regular course of studies.

To obtain new ideas for the promotion of safety we encourage the visiting of other plants of our company or of other companies by leading foremen or heads of departments whenever possible. By this means they can see how the other fellow guards his machinery, conducts safety meetings or runs competitions to promote safety and come back with the ideas so they can be worked into our system or make some improvement upon what we are already doing.

Each part of this elaborate system to put safety across in the cement plant, we think, is necessary and has contributed to whatever success we have had; but the one point we feel is absolutely needed, is foreman responsibility. The foreman is held responsible for his group. He must be in sympathy with the safety movement and see that every man under him is in sympathy with it. He

(*Continued on page* 74)

PRACTICAL ACCIDENT PREVENTION

By J. R. Davis, United States Gypsum Company

LAST year at the A. B. C. session of the National Safety Congress, which many of you doubtless attended, Mr. Colville, manager of the insurance department of our company, read a letter written by Mr. Knode, our vice-president, announcing a new plan of accident prevention. The plan was, in substance, that the United States Gypsum Company would cut the red tape of accident prevention; that we would stop *asking* our men to work safely, and *demand* that they work safely; or in other words, that we would become "hard boiled" in the matter of safety.

The reaction to this letter, by those attending the A. B. C. session, was varied. One or two of those present reacted favorably, but the majority felt that the plan was too drastic to achieve the results desired. The plan, however, was put into effect; and today I want to discuss the reasoning that led to its adoption, in the hope that our experience may be of benefit to others who find themselves in a similar situation.

A year and a half ago the United States Gypsum Company was practicing all the conventional ideas of accident prevention. We had safety committees, gave safety prizes, gave safety dinners, conducted no-accident campaigns, held safety rallies, etc. Despite these efforts we were confronted with steadily mounting accident costs, and an alarming list of fatalities. Mr. Knode, our vice-president, was the only one among us who saw clearly the cause of the remedy, and it was his clarity of vision that developed the plan announced at the A. B. C. meeting last Autumn.

This plan has produced results; and I expect as I have said, to show you that sound reasoning led to its adoption, and that, in our case at least, the decision to adopt it was the right one.

Accident Prevention Like Life

Accident prevention, looked at in one way, is like life. Some succeed in life; others do not. Some succeed in preventing accidents; others do not. The sound preparation for success in life is education, acquired either in institutions of higher learning or in the school of experience. Education by itself does not bring success. But education, plus application, plus the desire for success, inevitably brings success. The same chain, education, effort and desire, prevents accidents. In other words, education as to the causes of accidents and the manner in which accidents can be avoided, plus the application of that education, plus the desire to avoid accidents, brings success in accident prevention.

It appears to us of the United States Gypsum Company, that the greater part of the safety work we have done in the past has been educational. Now we are applying the education. And we make the utilization of the education compulsory. No longer do we tell employees that they should wear goggles, or that they *should* shut down machinery that is to be oiled, because education and experience have taught them that these things *should* be done. We tell employees that they must wear goggles, and that they must shut down machinery that is to be oiled; that if they fail to do these things their jobs will be in jeopardy.

And to some of you here today that attitude may seem an about-face from me, for a year ago I told you that safety primarily is a sales problem, that the idea of safety must be sold to employees. I still believe that the idea of safety must be sold or, in other words, I believe that employees must be educated to the importance of safety. Our experience, however, indicated that education reached 90 to 95 per cent of the men and was voluntarily accepted by them, but it was the other 5 or 10 per cent who simply would not accept it that was ruining our accident record and raising our costs. For this reason we changed our policy to one of compulsion and demand that they apply their knowledge of safety or suffer the consequences.

Application of a Common Principle

The statements I have made may sound radical. Actually they are not. All of you gentlemen apply the principle described in your everyday affairs. Experience has taught you, for example, that a crusher must be started before rock is fed into it. Suppose one of your workmen dumped rock into a crusher and then tried to start it. The result would be one or two hours of operating time lost, due to the necessity of cleaning out the plug-up. What would you do to such a man? You would reprimand him or fire him on the spot.

Suppose again that you had planned a shot in your quarry, and had left instructions as to how the shot should be loaded. Suppose the shot to be a failure that delayed operations and piled up expense. In investigating the cause of the poor shot you find that it had been loaded contrary to your instructions, because some person thought it didn't make much difference how the charge was placed. What would happen to that person? He'd be severely reprimanded or fired; and neither reprimand nor discharge would strike you as particularly radical.

But if some workman violates a safety rule, and

is laid off, or fired, in consequence, the action is considered radical, or "hard boiled." Why should it be? It is no more than the application of the same discipline to the matter of safety as is applied to costs, quality and numbers of other things connected with manufacturing. You discharge a workman who wastes your money or time. Certainly a careless workman wastes both. And certainly a workman discharged for violating a safety rule is an example to other workmen.

Now let's see if comparable discipline is applied in your own home—and applied to a problem of domestic safety. The example I am to cite will not be within the personal experience of all of you gentlemen, but it will be near enough to personal experience to bring home my point.

Let's say each of you lives near a river; and let's say that each of you has a small son. The river you regard as dangerous. The son you regard as precious. On a certain night the young man comes home with wet hair. You ask him how he got his hair wet. He tries to evade a direct answer, but you finally drag out of him the confession that he has been swimming in the river. Immediately you are alarmed for his safety. By reason and persuasion you attempt to convince him that the river is dangerous, and that he should not go swimming in it again. A week passes, and again you discover your son with wet hair, and again he confesses, reluctantly, that he has been swimming in the river. You repeat your arguments; he promises to respect your wishes. Another week passes, and once more you find the boy with wet hair, and once more you extract the confession that he has been swimming in the river. What do you do? Do you again reason with the boy? Hardly. Convinced that reason and persuasion are of no service, you take the boy to the wood shed; and there you discipline him—with a strap.

Are you acting differently then, than we act when we discharge a man who violates a rule of safety? Are you dispensing a different brand of justice?

After all, accident prevention simply is good business, as discipline is good business. And the plant wherein discipline is maintained not only will be a safe plant, so far as accidents are concerned, but in virtually every instance will be a plant wherein manufacturing costs are low, quality is high, and "housekeeping" is efficient.

What Are Accident Costs?

Webster defines mining as "the art of extracting ore from the ground at a profit." Quarrying is open pit mining. If we are good miners, market conditions being favorable, we make a profit, largely by keeping our costs down. Accidents are an item of cost; and if we attempt to operate without an accurate knowledge of cost of accidents, we fail, in part, at our jobs.

But what are accident costs? Are they solely the money paid in premiums for compensation insurance? We don't think so. In our case we compute costs of accidents, not only by the premiums we pay, but by money spent on hospital bills, doctor bills and compensation actually paid to the injured man or his family. These figures we compare with our past costs in the same manner that we compare operating expenses and profits with the past. And it was this comparison of accident costs, on the basis just described, that led us to abandon the more sentimental policy of accident prevention by wheedling and persuasion, and to substitute for it the clean-cut policy of individual responsibility of each workman to observe the safety rules that we make.

And I might point out, that if you find compensation rates high, the best way to force them lower is to reduce the number of accidents in your plants.

Results of the New Plan

As I have already said, the plan of making the individual workman responsible for his own safety has been in operation for approximately a year. You want to know the results, of course. Before I give them to you, however, I am going to read to you a letter, written by one of our works managers who was quick to grasp the significance of the plan. This man has had much experience in mill operation and his point of view is more practical than literary. So disregard an occasional violation of the rules of syntax and grammar; and heed the meat of his remarks. Here is what he said:

"I have your letter setting forth our safety record for the year to date. This report is disheartening, and after all you have done to promote safety, the facts must be a keen disappointment to you.

"I have read the letter many times, and in the following letter I have tried to analyze it from two view-points. Though I may not have succeeded in my analysis, I have, at least, set forth my true thoughts, and expressed my attitude.

"Under the present plan we try to promote safety by appealing to our workmen, the strongest note in this appeal being that we are seeking safety for them. We invite them to serve on our safety committees, ask their advice as to how we can better conditions, try by means of bulletins, movies, literature, and 'silver-tongued' orators to show them the errors of their ways, and the heart breaks, wants, and suffering that is caused by accidents.

"We make personal appeals to our workmen, begging them for the sake of their loved ones to

work carefully and not get hurt, and as a net result of the time and money spent we have a mounting accident cost, and workmen whom we have not only failed to convince that safety paid but that we were even sincere in our purpose.

"Now, it is very evident that we have failed. Why? I can only give my opinion, and that is, that there has been too much division of authority, or rather, no authority, and too many uninterested men on our safety committees.

"The plant managers put safety work up to safety supervisors, who pass it on to the different committees and foremen. The safety supervisors have their routine inspections and meetings, and consider the work done when they have turned in the regular number of suggestions concerning guards and defective equipment, should they be able to know what defective equipment was.

"These reports are all nicely typewritten, and presented to the works managers. And as there are a lot of them, and as he has a number of trusted employees on the committees, he assumes that his plant is as safe as a nursery, and that all his employees are true disciples of safety. Then there is an accident, but no one is to blame. The required number of men have been on the committees. The inspections have all been made on the day and date set. Meetings have all been called to order at the specified time. The minutes and records are all complete. The safety supervisors have done their duty in a routine manner, and have complied with all rules as set forth in the safety bulletin governing the plant safety organization. This done, why should they be to blame for an accident. They all are sorry, of course, and express their sympathy in different ways. By sending flowers, or, if necessary, by taking up a collection. This done, their interest, which was first aroused at the time of the accident, stops, and the accident is something that just happened, and happened because we had a safety man in the office reading up on improved safety methods written by a man also sitting in an office; because we had a committee of foremen who served on the committee only because they had to and whose minds were more concerned regarding the quality of a certain product, or the production of a certain machine than they were concerning the inspection they were making, and whose idea of safety was to run in as many suggestions as possible regardless of their value; because we had a committee of workmen, who, believing that we were not sincere in our efforts, were not sincere themselves, but as they had to do something, turned in a lot of recommendations, the chief value of which was to take up the stenographer's time in writing them. This being the cause, the remedy would be:

"First, a safety supervisor who knew what he was required to do, and had the authority to do it. In a small plant this would be the superintendent, and in a large plant the assistant works manager, for it is just as essential to have someone with authority in charge of safety as it is to have someone with authority in charge of quality or production. In fact, the three are so closely related that they should come under one head.

"This supervisor, whoever he would be, would have as his only assistant a man who would keep records necessary to carry on the work. These records should be a true statement of conditions, and not records that lead to the belief that we were making progress when we were not; and should include records of the men, who as far as the workmen are concerned, are the company: the department heads, foremen and the key men on whom the success of the safety movement depends. These men were chosen as foremen, etc., because they were above the average and able to lead, and do lead in everything but safety. In safety, however, we have a division of authority, and, as stated before, a safety supervisor with ideals that do not fit conditions, a foremen's committee, which knowing that they are not held responsible, have no interest other than to get their inspections done and to get back to the job for which they are held responsible, and a workmen's committee, the main function of which is to clutter up the joint meeting with numerous and worthless suggestions, but which must be taken up and disposed of in a manner that will not offend them. It is true that it is a part of this committee's duties to interest their fellow workmen in the safety-first idea, and to caution them whenever they resort to unsafe or insanitary practices. But it is not done. And as I see it, it can not be done. When men are not sincere they can not be convincing.

"Second, as they have no authority they can only suggest.

"Third, as the workman lifting on one end of a board considers himself just as good as the man on the other end, and will resent anything he may say regarding his habits or practices, many workmen resent safety warnings.

"Fourth, the average workman, whether he be a high priced mechanic or a common laborer, has no use for tale bearers, and though he may know of unsafe practices, will not report them. The only way such practices can be found out is through the foreman, and as he would be responsible for the safe operation of his department, he would have authority to see that unsafe practices or habits be stopped, or he could dismiss the workmen, and when he did, it would be his duty to talk to the man and impress on him that he was being dismissed because he had persisted in doing what

the company considered as detrimental to its interests.

"I would, in this way, show our workmen that safety paid, not only by eliminating pain, want, and suffering caused by accidents, but also pain, want and suffering caused by the careless workmen having no place in industry.

"Safety is an ideal worthy of our best efforts, and it would be sublime if it could be obtained by ideal methods. But if this is not possible, let us strip it of its glamour and make it just what it should be, a cold business proposition, in which all sentiment is left out.

"This will require work by plant managers, work by the department heads and foremen. And the measure of success obtained will be in proportion to their efforts. To me this does not appear as added work, but an opportunity to show you that we can and will, if it is within our power to do it, attain your safety ideal."

(Signed) F. O. GOTCH,
Works Manager.

This was the response of a practical operator to Mr. Knode's plan. And the results of his attitude immediately were apparent in his plant. Others, however, did not grasp the vitality of the plan as quickly as he did; and were slow to put it into operation. But August, 1928, the busiest month we have ever had, and one in which we employed many new men, was one of the best months from the view point of safety, that the United States Gypsum Company has had. And with your permission, I will read details of our August safety record.

	August, 1928	Year to date 1928	1927
Fatal	None	5	6
Permanent total	None	1	2
Disability one or more days	16	111	127
Total reportable	65	420	473

In order to better apply the principle of individual responsibility for accidents, we now analyze all accidents by causes, dividing them into personal and impersonal classifications. We further break them down so that the real cause of each accident may be known, and the proper remedies to prevent repetition may be applied. I have a few copies of our method of analysis if anyone wishes one.

In addition to this we require our foremen to send in a complete report of each accident. This report sets forth the circumstances under which the accident occurred, leads up to a conclusion as to the real cause of the accident, and requires a statement as to what action is being taken to prevent a repetition of the accident. The application of our method of analysis to our August accidents gives us the following classifications of causes:

Personal

1. Supervisor 1
   Incomplete Instructions .....
2. Worker .....
   A—Mental Deficiency—
      Ignorance 1
      Poor Judgment 6
   B—Mental Laxity—
      Inattention 40
      Non-co-operation—(disobedience of rules).. 2
   B—Physical Defect—
      Weakness 1
   D—Unsafe Practice—
      Clothing (gloves) 1
      Haste 2
      Short Cuts 3

The point most to be observed in the analysis just presented is that 40 out of 57 accidents were due to inattention or carelessness. Accidents resulting from these causes are the ones we are constantly striving to overcome, for it is these types of accidents that are most frequent and least necessary. It may occur to you that our August record does not show, in preventing these types of accidents, success comparable to the enthusiasm with which I have presented our new plan of accident prevention to you. In our plants, however, the percentage of accidents resulting from inattention and carelessness is declining sufficiently to convince us that we are on the right track; to convince us that so soon as all factors concerned in the operation of the plan are thoroughly understood the results will far outstrip anything that we have accomplished in accident prevention in the past.

Accidents

PERSONAL

1. Supervisor (Foreman)
   - A. Faulty Instruction
     1. None
     2. Incomplete
     3. Erroneous
   - B. Operations—Improper
     1. Layout of Machinery
     2. Layout of Operations
     3. Layout of Processes
   - C. Poor Discipline
     1. Rules Not Enforced
     2. Horseplay
2. Workman
   - A. Mental Deficiency
     1. Ignorance
     2. Inexperience
     3. Poor Judgment
   - B. Mental Laxities
     1. Excitability
     2. Violent Temper
     3. Sluggishness or Fatigue
     4. Inattention
     5. Non-Co-operation (disobedience of rules)
     6. Worry
   - C. Physical Deficiency
     1. Defects
     2. Weakness
     3. Fatigue
   - D. Unsafe Practice
     1. Clothing—Improper, loose, long sleeves, ties, high heels
     2. Protection—Improper, no goggles, gloves, masks, shoes, hats, etc.
     3. Short Cuts
     4. Haste

IMPERSONAL

1. Building Conditions Unsafe
   - A. Fire Protection
   - B. Exits and Openings
   - C. Floors
   - D. Miscellaneous
2. Working Conditions—Improper
   - A. Light
   - B. Sanitation
   - C. Ventilation (Dust)
3. Housekeeping—Poor
   - A. Improper Piling and Storage
   - B. Insufficient Room
4. Equipment—Defective
   - A. Machines
   - B. Tools
   - C. Miscellaneous
5. Hazards—Mechanical, Electrical, Chemical and Steam
   - A. Unguarded
   - B. Ineffectively guarded

MUSEUMS OF THE THE NEW AGE

"EACH man and woman, specializing in some phase of a single industry and living within the confines of that industry, forgets there is anything else important in life outside it. To such a one the sun rises and sets in terms of sheep shearing, or hog raising, or buttonhole making or whatever else brings him his daily bread. He never thinks of the textile industries required to produce his coat and hat, the millions of workers and heavily invested capital that evolved his five cent cigar, or the world wide net work of telephones and the great organization necessary to maintain it, when he picks up his desk telephone and says 'hello'."

"For the security of the nation, for the uprightness of the individual, for the welfare of the world, there must be today beyond any other known period, a definite step taken by leaders in all departments to cause everyone everywhere to know something of everything."

This is the way Mr. Charles T. Gwynne expressed the service which he felt an industrial museum, or several of them, could render modern civilization. He calls them "Museums of the new age," and he studied some already in existence in London, Paris, Munich and Vienna.

The question will naturally and rightly be asked, How can such a museum be of benefit to the non-metallic mineral industry? The answer will be self-evident when we see how the best of the foreign museums are equipped and of what their exhibits consist. Different methods have been employed in the different museums.

In the Museum in Munich the construction of a steel ship, for example, is boiled down to three parts so as to give a good general idea without the confusion due to too many facts. At the Science Museum in London very much the same policy is followed except that experimental toys are excluded and only practical applications of science to industry are shown. This method is of the greatest benefit to the greatest number, namely, the casual visitor, old or young, who needs to get some idea of the industrial world around him. Both of these institutions, however, have very fine technical libraries for the use of the professional student.

On the other hand, at the Paris Museum, known as the Conservatoire des Arts et Metiers, the student comes first and there are several lecture halls and free public courses on industrial science. In Munich the same is true to some extent but not entirely. Here the educational possibilities have been so highly developed that all school children over eight years old are required to make a trip to this museum once a year with an instructor.

This kind of museum is especially planned on the modern educational principle that "knowledge is doing." That is in order to learn about a thing most effectually it is best to do it.

Many of the models, from full sized airplanes and locomotives to many kinds of stationary machines, are run in full view under the control of the visitor; and in all cases they have been cut in half or otherwise dissected so that the innermost workings are brought plainly into view. At the Munich Museum they even give souvenirs to attract casual visitors and especially children who are encouraged to view and "play" with the moving exhibits, carefully protected against accident, as much as they like.

Historical relics are also preserved in these museums. At Vienna is shown the first ice-making machine, at Munich the first Diesel engine and the actual air pump and air bells of Otto von Gueriche who in 1654 staged a most remarkable show for the Emperor by joining the bells to form a hollow sphere, pumping out the air with the pump shown here and vainly attempting to pull them apart with thirty horses. In the London Science Museum is the entire attic workshop of James Watt and in Paris the original laboratory equipment of Lavoisier who worked in the 18th century. These are just a few examples; there are endless others.

Now an effort is being made to start a similar museum in New York. In fact one has already been started and is a most fascinating place to visit. There seems to be something in it of interest to almost everybody and so far only a beginning has been made. Thus anybody engaged in almost any branch of the non-metallic mineral industry will find exhibits which have some connection with his calling.

For instance, there is a model of a power plant showing all the details of boilers, steam pipes, turbines, generators, switches, switchboards, cable and so forth. Another exhibit shows in a striking manner the effect of different ways of lighting machines with and without glare. These are entirely under the control of the visitor so that he can switch on or off the different lights and study at his leisure the effects of each. Models of steam engines, various kinds of electrical apparatus and machine tools are shown in ways which cannot help but stimulate thought, clarify many details of operation and perhaps lead to new adaptations or other improvements.

Aside from these items of direct interest there are all the other fascinating exhibits having no direct relation to the non-metallic mineral industries except in so far as everything is more or less related and dependent on everything else in our present complicated life. This of itself is of sufficient importance to make it most desirable, if not imperative, that everybody should see and observe

them, even if only casually. It is perfectly safe to say that if anybody the least bit interested in seeing how the inside of things works once gets into this museum it will be very difficult for him to leave until he has seen things from end to end. And if children of junior high school age or older are along it is best to be prepared for a long stay. It will be impossible for most parents to be prepared to answer all the questions that will be asked but there are attendants and carefully worded explanatory placards to take care of this.

In time it is hoped that these exhibits will be greatly enlarged and housed in a building to be known as the Museums of the Peaceful Arts. The City of New York is expected to give an excellent piece of land for the purpose, the estate of Henry R. Towne has made a provisional endowment and an effort is being made to secure the necessary additional endowment. Even in its present stage of development the existing museum at 24 West 40th Street is well worth a visit by all who live in New York or come there on business.

Would it not be worthwhile for the various associations in the non-metallic industrials to investigate the possibilities of their respective industries taking part in the museums in the United States and preparing exhibits? We know from experience that the various museums would be willing to cooperate. Models of plants would appeal particularly. A collection of various stages of the material during production would be valuable too.

(*Continued from page* 68)

must be an example to them in safety; order them to work in a safe manner, and then be sure they carry out all the safety knowledge that has been imparted to them. The foreman must see that his group meetings are held; that every trivial injury, no matter how slight, is immediately reported; encourage participation in all outside safety movements, and lead his men by being present at all outside meetings himself. The success or failure of any group regarding safety is entirely in the hands of the foreman.

"Putting Safety across in the Cement Plant" is not an easy job or one that can be done spasmodically, but it requires the effort of everyone in the organization to be everlastingly at it. That it pays, there can be no doubt, as is easily shown by the results published by the Portland Cement Association and the satisfaction to each of us. "And the end is that the workman shall live to enjoy the fruits of his labor; that his mother shall have the comfort of his arm in her age; that his wife shall not be untimely a widow; that his children shall have a father, and that cripples and helpless wrecks who were once strong men shall no longer be a by-product of industry."

American Road Builders Denounce Driving at Unreasonable Speeds

The American Road Builders' Association in its national drive for safety on the highways states that unreasonable speed is a major factor in causing highway accidents. The association stated that 2,706 persons were killed in 1927 as a direct result of unreasonable speed which exacted a greater number of fatalities chargeable directly to motor vehicle drivers than any other single factor except inattention.

The Association pointed out that "It is the degree of courtesy and caution used while driving which contributes to safety on the highways. There are places where a reasonably high speed does not create a hazard, and others where a similar speed verges upon reckless driving. It is the application of courtesy and caution to the gauging of speed which is desirable, rather than the adherence to a series of rules for the speedometer." The confining of all vehicles to a low speed at all times is not urged but rather that motorists keep to the principles of courtesy and caution when gauging their rate of travel.

Light Porous Concrete

To produce a porous concrete, 0.1-0.5 per cent of an alloy of calcium is added to the cement mixture before addition of water. Moulds are only filled to the extent of 70-80 per cent and the evolution of gas can be regulated to require 30-45 min. or 3-4 hours. The concrete can, if desired, be made lighter than water, the apparent sp. gr. varying, of course, with the proportions of the usual ingredients. The relation of compressive strength to apparent sp. gr. is given by curves. The two diminish together, so that the lightest forms are only suitable for filling material, etc. A further addition of the calcium alloy results in a part of the gas evolved being lost. With a proper mixture the gas pores are very uniform, and heat conductivity measurements show that the porous concrete is a very good insulating material. It can be structurally combined with iron in the same way as ordinary concrete. J. Meyer (Chem. Fabr., 1928, 433-435, 449-450). B. C. A.

New Structural Steel Record

Demand for building steel in the United States reached a new high mark in August, reports to the U. S. Commerce Department indicate. New orders received during the month amount to 95 per cent of the total tonnage capacity of all plants in the country, according to the Commerce Department computations. This is said to be the highest percentage recorded since the year 1909. The nearest approach to the August figure in recent months was 92 per cent reported for July, 1927.

ACCIDENT PREVENTION AND INSURANCE

By Walter Clinton, Metropolitan Life Insurance Company

RECENT years have developed a decided interest on the part of various insurance carriers in accident prevention. It has been found that a very close relation exists between insurance and preventive measures. As asserted by Professor Albert W. Whitney, of the National Bureau of Casualty and Surety Underwriters, it is recognized that the function of insurance as a preventer of loss is equally important with the function of insurance as a distribution of loss, or in other words, as a great conservatorial medium. The reactions and tendencies of our insurance carriers notwithstanding, it is believed the role of conservator has rightly been undertaken by them. The nature of the business followed, predicted by the operation of economic laws, has borne an influence on such carriers toward assuming this role.

No attempt will be made here to prove this assertion except to example one of the primary forces which govern the existence of an insurance company. Casualty insurance rates, as you probably know, are determined on the basis of past experience of any one industry for a period of years. If accident costs increase, it must necessarily follow that the rates cannot cover these costs and the carrier experiences a loss; but, should the cost of accidents decline, it may be presumed that the rates will be sufficient and afford the carrier an opportunity for profit.

Competition among insurance organizations has played an important part in the reduction of industrial accidents. Casualty insurance rates may be said to be practically identical for experience indicates that should competition be based on rates, these may become so low as to jeopardize the solvency of the carrier. The matter of policy would also be involved for the insured for it might be possible for some organizations to employ methods to secure their insurance at a lower rate while others paid more. Insurance carriers are also prohibited from competing on the basis of commissions paid to representatives because this would bring the rates too high. Competition, therefore, has been limited practically to the field of service, which has introduced our merit-rating system, that is—the establishment of rates on the determination of the physical merit of the risk after certain debits and credits have been allowed according to the schedule rate. This is a desirable form of competition and assists the insured to obtain the best possible rate, reduce his accident costs and to maintain his plant in an efficient manner.

It is not believed that all of us realize the enormity of industrial accidents until figures from some authentic source are presented. It has been estimated by the Statistics Committee of the National Safety Council that the number of fatalities for 1927 is approximately 24,000—about 300 more than 1926; and that non-fatal lost time accidents will approach three and one-quarter millions in number, or an increase over 1926 of almost 800,000.

With these estimates in mind, is it any wonder that insurance companies are vitally interested in accident prevention and are continually striving to curtail this extravagant waste of man power?

A little over thirty years ago, an insurance company hired an inspector to determine the physical conditions of the properties of the risks written. Such an innovation, as it was then, was subjected to much ridicule but the result of the move is that today insurance companies employ thousands of engineers and expend millions of dollars on preventive work.

Now there must be some reason for our insurance companies making accident prevention a necessary part of their business. There is, for insurance cannot be underwritten satisfactorily either to the carrier or the insured on a rising loss ratio. As mentioned earlier, it is far more advantageous if the business is conducted on a falling loss ratio for price affects the placing of insurance. It is quite obvious that high rates are conducive to self-insurance among risks who enjoy a favorable loss experience, thus creating what is termed an "adverse selection" against the established carriers, or increasing materially the percentage of less desirable risks having insurance protection. So we find highly organized bureaus within our insurance carriers, carrying large staffs of engineers competent to advise employers on safety educational mediums and methods for overcoming hazards.

Mr. Ethelbert Stewart, United States Commissioner of Labor Statistics, has given us two tests by which the effectiveness of a safety program can be measured with relation to insurance costs. First, consider the attitude of the carrier, which is: How much do we as an insurance carrier have to pay out of the premium rate which we assess against your payroll? The second test is one for the insured to inquire of himself: How many people do we hurt and how badly do we hurt them, and are we injuring fewer this year than last, and even though we may be hurting fewer people is this offset by the severity of the injury so that more lost time and actual suffering comes from the fewer number of cases than the larger number? It is believed these two tests, properly applied and determined by the insured, will not only indicate the results being obtained by his safety work but also

the justification of a decrease or increase in rate.

So far in my remarks, I have brought out only some of the economic issues of accident prevention as applied to insurance. While it is a conceded fact that public interest in safety is attached to its humane aspects, it would be unfair to say the tendencies of our insurance organizations are not motivated in a large part through these same principles. Nearly all, if not all of these organizations have realized that they are social service institutions and not merely agencies for the assumption of insurance risks and the payment of claims. Their literature, posters, preventive work and other activities are designed mainly for the welfare of the general public and, excepting perhaps a small element of good will, there is very little tangible return.

Safety work has become a science and it would be pleasant to anticipate a one-fourth reduction of the present accident rate. Insurance may offer a compensation for accidents and their direct cost, but it is impossible to insure against accidents, their indirect costs to industry and the suffering involved. Our hope lies then in stimulating a real interest in accident prevention in all industries, but meanwhile we must find ways and means to minimize the casualties subject to our "peace time" industrial life.

Many of you will remember the practice of the old time insurance inspector who would enter the plant from the back door, make his inspection of safeguards and depart with but few people knowing who he was or what he was doing.

Contrast that procedure with the methods employed to reduce accidents by insurance organizations today. First, upon entering a plant, contact is made by the insurance representative with the highest operating official. It is highly important that this official be sold on accident prevention, his responsibility made known to him and his active support secured. Many officials entertain the thought that the fact his company is insured for accidents, the burden of prevention rests with the carrier and its engineers. This is a fallacy, for no insurance company nor form of insurance can directly prevent an accident. It is true the insurance company through its enginers can offer suggestions and recommendations which assist a plant's experience, but the responsibility and application of these recommendations rests with the operating official who places the recommendations into effect through the superintendents and foremen down to the operatives who actually experience the accidents.

Second, an analysis of accident records is begun, tabulating and charting the records to determine the cause and trend of the accident experience. This study is very important, for the solution of any problem demands fact-finding and a knowledge of circumstances surrounding accidents is most essential.

Third, the engineer interviews the supervisory force and foremen to determine their safety attitude and secure their cooperation, for without their constant and active cooperation no safety program can hope to gain proper results.

Fourth is the study of company organization and policy. This is necessary to determine that type of safety work which would be most effective. It is obvious that a program designed for a meat packing plant would not be applicable to a railroad company, even though the principles of safety in both instances are fundamentally alike.

The fifth factor of the engineer's survey is a study of the existing safety educational work, its effectiveness and possible means for improvement. This study includes safety organization, friendly competitions, advertising safety, first aid instruction and other plans to maintain interest.

The sixth step is a survey of physical conditions and mechanical guarding to remove as many "bugs" as possible from the plant's layout.

The seventh and last part of the survey is a conference with the officials to discuss the findings and to submit a plan adaptable to local conditions and policy.

Such a procedure, with few modifications, can be applied to a small plant as well as a large one. The need of safety work in small industrial organizations is indicated by statistics, for, generally speaking, a number of small plants will say an operating force of 1,000 men have a higher rate of frequency and severity than the large plant with the same number of operatives.

In conclusion, may I ask that you consider your insurance carrier as a friendly agency, whether it be your own association, a state, casualty, life or other insurance body. They function as consultants and advisers and no longer follow the back-door policy of creeping in and out of your plant, unseen, unknown and unwanted. Your problems are their problems and they strive to serve you and help you eliminate the so-called by-product of industry —the crippled employee.

Soft Coal Production Drops

Coal production in the United States this year is the lowest since 1924, latest reports of the U. S. Mines Bureau indicate. Output of the bituminous fields for the eight months to September 1 totals approximately 312,812,000 net tons, it is shown. This is 41,503,000 tons less than in the corresponding 1927 period when 354,315,000 tons were mined, and 44,521,000 tons below 1926 when production was 357,333,000 tons.

SLAG IN CONCRETE ROADS AND PAVEMENTS

THE National Slag Association of Cleveland, Ohio, has published Symposium Number 7 of a series on blast furnace slag. This booklet contains abstracts from various magazines and papers, as well as statements from recognized authorities on cement, concrete, and building and road construction relative to the use of slag as an aggregate in concrete.

Slag Concrete Surface Courses

Concrete roads have found more favor in America than in foreign countries, but there are a number of instances where slag concrete roads have been built outside of the United States. "Streets and Highways in Foreign Countries," a summary of U. S. consular reports in 1891, shows that concrete roads made of blast furnace slag, cinders, and Portland cement were in existence at that time.

Kenneth Gardner, City Engineer's Department, Shanghai, China, in an article, "Chinese Slag Concrete Road," published in the National Slag Association Bulletin, September, 1920, says that while building a road in the Fokien section of Shanghai a pile of blast furnace slag was discovered along the right-of-way. As it was of a size suitable for aggregate, it was used for about 300 feet of the road. After a year's use this road showed no visible signs of wear, although subjected to unusually severe abrasion, as the Chinese used steel shod wheelbarrows loaded to 800 pounds.

The general attitude in the United States regarding slag as an aggregate in concrete highways may be seen from the following reports. The United States Bureau of Public Roads in Bulletin 1077, published October 21, 1922, says that coarse aggregate for concrete pavements usually consists of gravel or crushed stone, although blast furnace slag is occasionally used. The choice between these materials is largely dependent upon local conditions, as satisfactory concrete pavements have been constructed with each.

John H. Bateman, Professor of Highway Engineering, Louisiana State University, in a book, "Highway Engineering," published in 1928, states that "Screened gravel, crushed gravel, crushed slag and crushed stone are all used for coarse aggregate for concrete pavements, their selection usually being determined by economic considerations."

The widespread use of slag as an aggregate in the United States is illustrated by the following statements: A. S. Rea, Chief Engineer, Bureau of Tests, Ohio State Highway Department, in "Mineral Aggregates for Highways," published in "Pit and Quarry," February 16, 1927, says that in Ohio slag is included among the mineral aggregates used for highway construction and that in certain sections of the state crushed slag has been used extensively in both macadam and concrete.

Col. Robert S. Beightler, Chief Engineer, Bureau of Construction, Ohio State Highway Department, in an article published in the "Contractors' and Engineers' Monthly," January, 1928, gives the results of tests made of the Mayfield Road in Cuyahoga County. This road consists of about 14 miles all told of both 18 and 24 foot widths. Cleveland slag was used as coarse aggregate and lake sand as fine aggregate, and the mix was approximately 1:2:3. Six by 12 inch concrete cylinders made during the construction averaged 2,420 pounds per sq. in. after 7 days, 3,827 after 14 days and 4,582 after 28 days. Cores cut out of the pavement after 90 days showed an average strength of 5,030 pounds. Transverse tests of beams made from this concrete showed an average modulus of rupture after 14 days of approximately 715 pounds per sq. in. According to Col. Beightler no weak top crust or scaling has appeared on the surface of the pavement and the results are very gratifying.

Probably the longest stretch of slag concrete highway on record was completed by the Alabama State Highway Commission in Calhoun County in 1925. 1.60 barrels of cement per cubic yard of concrete and 5½ gallons of mixing water per sack of cement were used, resulting in a workable concrete with a slump of ½ to 1 inch. The minimum strength of tests made after 28 days was 3,000 lb. and the average was 4,300 pounds per sq. in.

W. H. Brooks, engineer, Birmingham Slag Company, in an address before the Annual Meeting of the National Slag Association in 1925 describes the construction of the 17½ mile Birmingham-Montgomery Highway, which was built in 1924. A mix was designed, using slag as coarse aggregate, of 1:2.27:3.30 and using about 1.61 barrels of cement per cubic yard of concrete. Test cylinders were taken at the job, and these, after 28 days, averaged over 4,600 pounds, and some of them as high as 6,271 pounds per sq. in. Sixteen cylinders taken were tested by the Bureau of Public Roads at Washington, D. C., and averaged 4,499 lb. per sq. in.

Numerous other articles and papers are quoted in the Symposium describing roads built in various parts of the country using slag as the coarse aggregate and giving results of tests made from this concrete which were uniformly satisfactory.

The National Slag Association in 1921 compiled a list of slag concrete pavements in the United States which showed a total of 212.65 miles or 2,392,899 sq. yds. These were distributed among the following states: Ohio, Pennsylvania, Georgia, Indiana, West Virginia, Connecticut, New York

and Alabama. Since then such roads have also been constructed in Delaware and Florida after experimental sections had been built with satisfactory results.

According to the Symposium the total mileage of slag concrete pavement in the United States is now about 1,116 miles, exclusive of base courses, which add another large total, and the list is admittedly incomplete, due to lack of information.

Practically all of the technical societies and road-building groups by reports or specifications have approved of slag as an aggregate in concrete pavement. These include: American Society of Civil Engineers; American Society for Testing Materials; American Concrete Institute; American Society for Municipal Improvements; American Association of State Highway Officials; Portland Cement Association; U. S. Bureau of Public Roads; U. S. Bureau of Standards; U. S. Master Specifications (Federal Reserve Board); and the State Highway Departments of Ohio, Pennsylvania, Alabama, Delaware, Florida, Georgia, Kentucky, Maryland, New Jersey, New York, North Carolina, West Virginia, New Hampshire and Utah.

Slag Concrete Highway Tests

The Scientific American, in an article, "Putting Slag to Work," published in the July, 1925, issue, says that any remaining doubt of the behavior of slag in concrete highway construction because of unfavorable results of compression and wear tests of the aggregate has been dispelled because of the ability of the material to stand up under heavy traffic under severe climatic conditions.

The annual report of the United States Bureau of Public Roads for 1923 describes a series of concrete tests made at Arlington, Virginia. Ten stones from ten different sources, nine gravels from nine different sources and five slags from two sources were used as aggregates in this test, in which 62 ten foot sections of different concretes were laid in the form of a circular track. A solid rubber tired truck wheel loaded to 3,000 pounds and traveling at a speed of 22 miles per hour was run over this track 300,000 times, and then 50,000 times equipped with non-skid tire chains. Three of the five slag sections contained slag classed as commercial aggregates, and these showed an average of 0.37 inches of wear at the completion of the test as compared to 0.31 for the nine gravel sections and 0.46 for the ten stone concretes. The best slag concrete section showed a wear of 0.27 inches, exactly the same as the best stone section, while the best gravel section showed slightly less. The poorest slag section, however, showed 0.43 inches, while four of the stone sections showed 0.52, 0.58, 0.78, and 0.87 inches, respectively, and the poorest gravel section 0.40 inches of wear.

Frank H. Jackson and J. T. Pauls, senior assistant testing engineer and highway engineer, respectively, of the U. S. Bureau of Roads, in a paper presented before the American Society for Testing Materials in 1924, commenting on these tests, state that slag concrete will wear as well as the best quality of stone and gravel, provided that the slag used be of ¾ inch maximum size and weigh not less than 70 pounds per cubic foot.

Slag Concrete Sidewalks and Floors

Slag concrete used in sidewalks and floors is subjected to wear very similar to that used in concrete pavements. In some cases floors in factories are subjected to even greater destructive forces, especially where steel tired trucks are used.

The booklet "Slag," prepared by Emanuel and Company, Catasauqua, Pennsylvania, in 1915, contains a number of statements by contractors and construction engineers endorsing slag concrete for this purpose. The same booklet also quotes results of tests made to determine the fire-resisting properties of slag concrete floors. Tests made by the British Fire Prevention Committee, described in the "Engineering News Record," February 1, 1906, compared concrete floors using as aggregates: blast furnace slag, broken brick, granite, burnt clay, coke breeze, boiler clinker, and gravel. The slag concrete withstood the fire test as well as any of the concretes and much better than some.

J. A. Shinn, in a paper, "Blast Furnace Slag as Structural Material," presented before the Engineer's Society of Western Pennsylvania in 1915, says that slag concrete was used as early as 1873 for platforms in railway stations of the London and Great Eastern R. R. at Middlesborough, England. A. C. Blackall, in "How British Railroads Utilize Concrete," in the July, 1925, issue of "Concrete" says that slag concrete is still being used for that purpose.

Slag Concrete Base Course

Most of the early slag concrete was used for base course or foundations because of its extreme toughness and resistance to disintegration. W. A. Esson, in "Why Not Use Slag?" published by the Illinois Improvement and Ballast Company in 1905, writes of slag concrete used by the Pennsylvania Railroad in concrete foundations for subway pavement in Chicago.

Many instances are cited where slag concrete has been used very successfully as a base for brick, sheet asphalt and bituminous concrete pavements throughout the country. Three hundred miles of such base course are listed in the Symposium, some of them being 15 years old and still serviceable.

Record September Construction

September construction contracts in the territory east of the Rocky Mountains reached a total of $587,674,000, according to the F. W. Dodge Corporation. The area covered in this record consists of 37 States and includes approximately 91 per cent of the total construction in the United States. The total of contracts awarded was the highest September contract total on record. It was 13 per cent ahead of the total for the same month of last year and 14 per cent ahead of August, 1928.

The September record brought the total amount of new building and engineering work started since the first of the year up to $5,132,944,100, representing an increase of 7 per cent over the corresponding period for 1927.

An analysis of the September building record showed the following outstanding items: $202,806,900, or 35 per cent of the total, for residential construction; $119,013,600, or 20 per cent, for public works and public utilities; $114,780,300, or 19 per cent, for industrial buildings; $60,068,000, or 10 per cent, for commercial buildings; $38,800,500, or 7 per cent, for educational buildings; and $23,845,700, or 4 per cent, for hospitals and institutions.

New projects contemplated which were reported in the 37 states amounted to $522,655,600, a decrease of 15 per cent from the total reported in the preceding month and a drop of 17 per cent from the amount reported for September of last year.

New York and New Jersey

New building and engineering projects awarded during September amounted to $154,895,500, in New York State and Northern New Jersey. This total shows an increase of 22 per cent over the previous month and a gain of 46 per cent over that of September, 1927. The following important classes of work were included in the total construction record: $65,011,700, or 42 per cent of the total, for residential buildings; $38,951,500, or 25 per cent, for public works and public utilities; $14,515,800, or 9 per cent for commercial buildings; $11,705,700, or 8 per cent for educational buildings; and $10,885,700, or 7 per cent, for hospitals and institutions.

Total construction for the first nine months for this district has reached the amount of $1,353,153,500 as compared with $1,258,225,000 for the corresponding period of 1927, an increase of 8 per cent.

Contemplated new work reported during the past month amounted to $164,949,900 which is 4 per cent less than August, 1928, but 5 per cent greater than September, 1927.

New England States

New construction work started in the New England States reached a total of $71,611,100 for the month of September. This amount is 84 per cent ahead of August and 108 per cent greater than September, 1927. The following were the most important classes of work during the month: $41,679,000, or 58 per cent of the total, for industrial buildings; $13,886,300, or 19 per cent, for residential buildings; $5,558,200, or 8 per cent for public works and public utilities; $4,285,500, or 6 per cent for commercial buildings; $2,473,000, or 3 per cent for hospitals and institutions; and $2,390,200, or 3 per cent for educational buildings.

During the first nine months of this year there was $395,284,800 of new construction started in this district. This total compares with $309,898,100 for the corresponding period of 1927, representing an increase of 28 per cent.

New projects reported as contemplated during the month of September reached a total of $30,156,300 as compared with $29,842,900 for the previous month and $30,428,300 for September, 1927.

Middle Atlantic States

Contracts awarded for new construction in the Middle Atlantic States (Eastern Pennsylvania, Southern New Jersey, Maryland, Delaware, District of Columbia and Virginia) reached a total of $66,170,000 for the past month. This amount exceeds that of August by 30 per cent but falls below September, 1927, by 15 per cent. The most important classes of work included $26,495,300, or 40 per cent, for residential buildings; $15,237,000, or 23 per cent, for industrial buildings; $9,870,000, or 15 per cent, for public works and public utilities; $5,426,200, or 8 per cent, for commercial buildings; and $4,513,000, or 7 per cent, for educational buildings.

Since the first of the year total contracts awarded for this district have amounted to $603,344,700 as compared with 579,324,000 for the same period of 1927, representing a gain of 4 per cent.

The total of contemplated construction reported for the past month amounted to $74,989,700, which is a decrease of 28 per cent from the previous month, but an increase of 18 per cent for the corresponding month of 1927.

The Pittsburgh District

New construction and engineering projects started in the Pittsburgh district (Western Pennsylvania, West Virginia, Ohio and Kentucky) amounted to $75,499,800. This total represents an increase of 32 per cent over that of the previous month and an increase of 7 per cent over September, 1927. The most significant classes of construction in this district were as follows: $24,043,900, or 32 per cent, for public works and public utilities; $16,954,400, or 23 per cent, for residential buildings; $12,809,000, or 17 per cent, for industrial buildings; $8,035,500, or 11 per cent, for

commercial buildings; $6,482,000, or 9 per cent, for hospitals and institutions; and $4,112,300, or 5 per cent, for educational buildings.

Last month's contract total brought the amount of new building and engineering work started in this district for the first nine months of this year up to $563,359,100, as compared with $616,641,300 for the corresponding period of 1927, a decrease of a little more than 8 per cent.

New projects contemplated which were reported during the past month amount to $55,257,800, an increase of 16 per cent over August, but 28 per cent less than September, 1927.

The Central West

The Central West (Illinois, Indiana, Iowa, Wisconsin, Southern Michigan, Missouri, Kansas, Oklahoma and Nebraska) reported a total of $145,744,200 of contracts awarded for new construction and engineering work. This amount is 12 per cent less than August, 1928 and 6 per cent less than the corresponding month of last year. The most important classes of work were: $62,418,700, or 43 per cent of the total construction, for residential buildings; $18,892,200, or 13 per cent, for commercial buildings; $27,592,400, or 19 per cent, for public works and public utilities; $16,936,400, or 12 per cent, for industrial buildings; and $10,244,300, or 7 per cent, for educational buildings.

The nine months' total of contracts awarded for this district amounted to $1,529,802,100 as compared with $1,332,359,200, for the corresponding period of 1927, an increase of 15 per cent.

The total of new projects contemplated which was reported for this district during the past month amounted to $130,839,700, which is 24 per cent less than the previous month and 34 per cent less than September, 1927.

The Northwest

New building and engineering work contracted for the Northwest (Minnesota, North and South Dakota and Northern Michigan) for the month of September reached a total of $6,811,400, as compared with $10,448,500, for the previous month, a decrease of 35 per cent, and $5,472,700 for September, 1927, an increase of 24 per cent. An analysis of the total contracts awarded shows the following items of note: $2,666,400, or 39 per cent of total construction, for public works and public utilities; $1,861,500, or 27 per cent, for residential buildings; and $1,397,100, or 21 per cent, for commercial buildings.

During the first nine months of this year there was $61,042,900 worth of new construction work started in the Northwest, as compared with $68,744,300 for the first nine months of last year, a drop of 11 per cent.

The total amount of contemplated projects reported in this district during the past month amounted to $6,307,000, which was 27 per cent less than the previous month and 3 per cent less than the same month of last year.

Southeastern States

Construction contracts awarded for the month of September in the Southeastern States (The Carolinas, Georgia, Florida, Tennessee, Alabama, Mississippi, Arkansas and Louisiana) amounted to $51,780,900. This total is 6 per cent ahead of August, 1928 but 9 per cent less than September, 1927. The most important classes of construction in this district for the past month were as follows: $21,985,500, or 43 per cent of the total construction, for industrial buildings; $10,269,800, or 20 per cent, for residential buildings; $7,125,600, or 14 per cent, for public works and public utilities.

The September total of contracts awarded in the Southeastern States brings the amount for the first nine months of this year up to $446,160,500, as compared with $461,932,900, for the corresponding period of 1927, a decrease of 3 per cent.

Contemplated projects reported last month in this district amounted to $45,646,300, a decrease of 24 per cent, when compared with the previous month and a decrease of 34 per cent when compared with the same month of last year.

Texas

Contracts awarded for new buildings and engineering work in the state of Texas during the past month amounted to $15,161,100, which is a drop of 12 per cent when compared with the previous month and 4 per cent when compared with September, 1927. The most important classes of work contracted for were as follows: $5,956,600, or 39 per cent of all construction for residential buildings; $3,205,600, or 21 per cent, for public works and public utilities; $1,855,400, or 12 per cent, for industrial buildings; $1,712,800, or 11 per cent, for educational buildings; and $1,542,600, or 10 per cent, for commercial buildings.

During the first nine months of this year there was $180,796,500 worth of new construction started in this state as compared with $169,357,300 for the corresponding period of last year, an increase of 7 per cent.

New projects contemplated which were reported in this state during September amounted to $14,508,900. This total was 24 per cent less than the total for the previous month and 42 per cent less than the total for September, 1927.

Cements Rich in Alumina

The raw material, together with a small quantity of fluorspar, is burned in a rotary kiln at a temperature below the m. p. now used without fluorspar. A. Hasselbach, Assr. to G. Polysius (U. S. P. 1,677,842, 17. 7. 28. Appl., 27. 9. 24. Ger., 19. 2. 24). B. C. A.

PIT AND QUARRY FOREIGN DIGEST

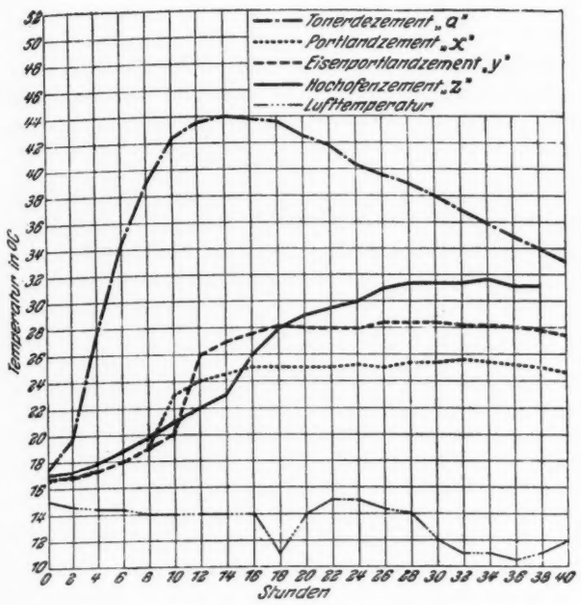


Figure I

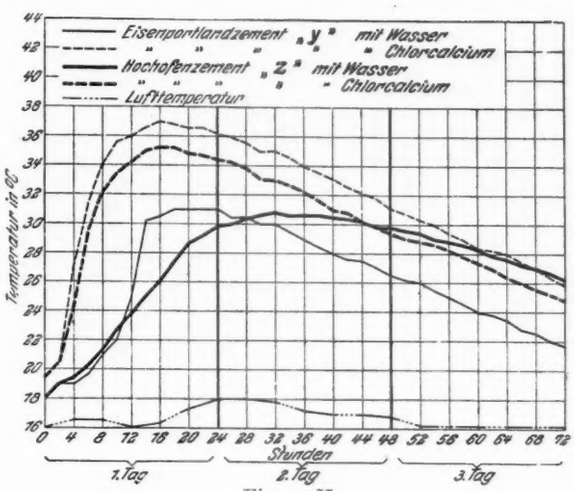


Figure II

Setting and Hardening of Concrete

Concrete mixtures instead of pure cement were used and forms were poured which were well insulated in order to measure the comparatively small amount of heat evolved, as the cement content of the concrete was only 20 per cent. The sand: gravel ratio was 1:3 in all cases. Figure I shows the course taken by the evolution of heat during setting. Aluminous cement reached the highest point in temperature, and in the shortest time. Addition of calcium chloride to the gauging water, a practice

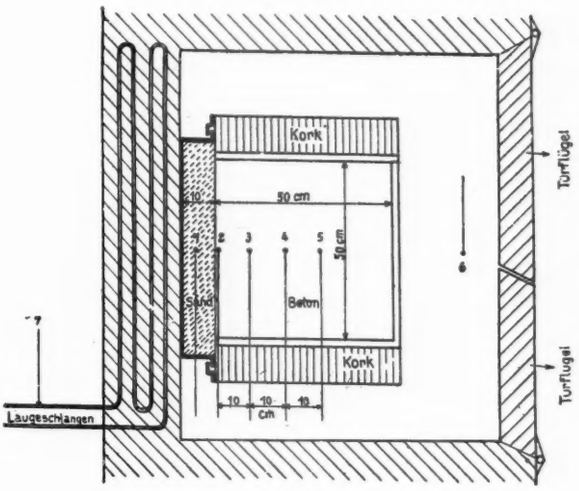


Figure III

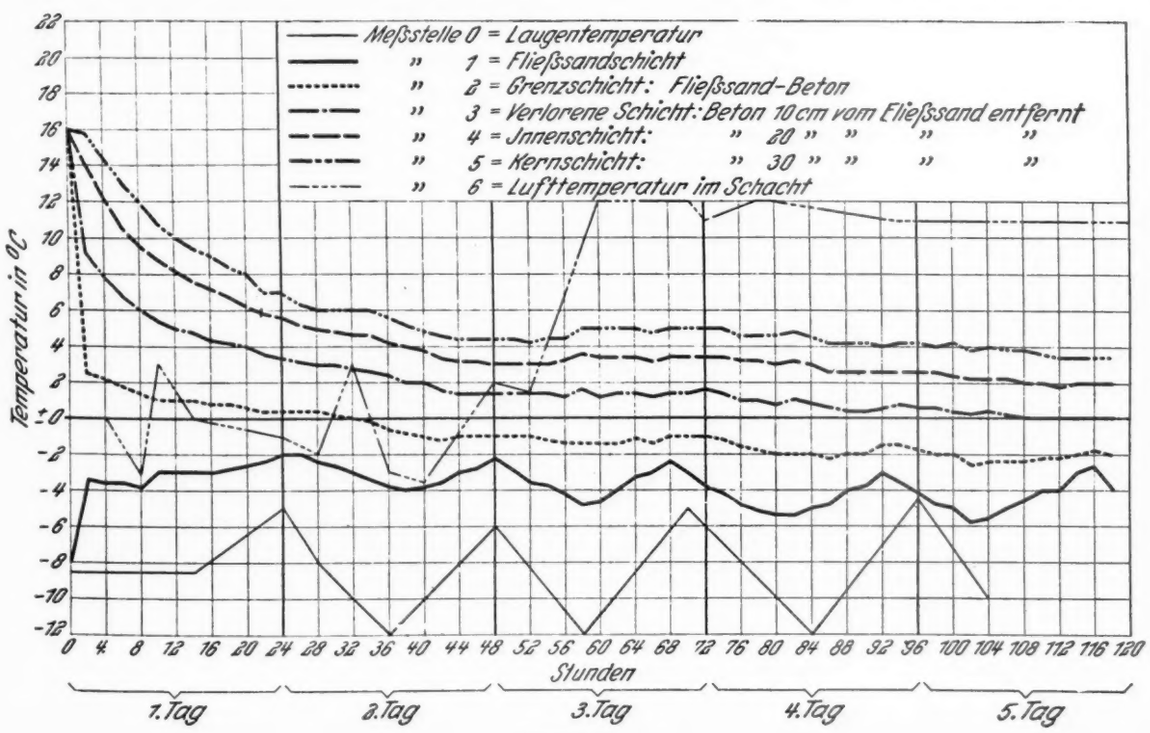

Meßstelle 0 = Laugentemperatur
" 1 = Fließsandschicht
" 2 = Grenzschicht: Fließsand-Beton
" 3 = Verlorene Schicht: Beton 10 cm vom Fließsand entfernt
" 4 = Innenschicht: " 20 " " " "
" 5 = Kernschicht: " 30 " " " "
" 6 = Lufttemperatur im Schacht
Temperatur in °C
Stunden
1. Tag
2. Tag
3. Tag
4. Tag
5. Tag

Figure V

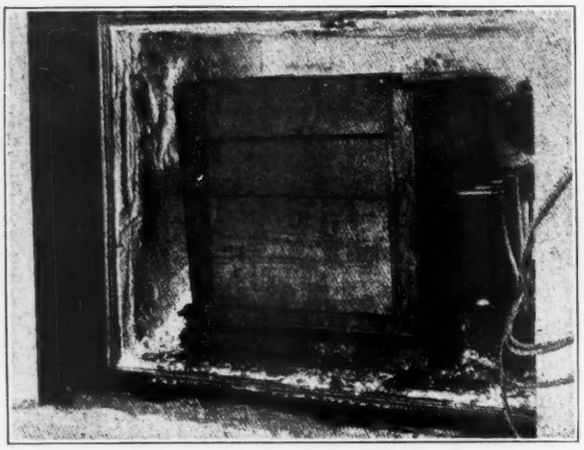


Figure IV

often recommended for low temperature work actually does increase the heat evolved on setting as is shown in Figure II. The solid lines in this figure show the temperature during setting of an iron portland and a blast furnace cement concrete gauged with water alone. The dotted lines show the same cement concretes gauged with water containing calcium chloride. The addition of calcium chloride actually does raise the maximum temperature at setting 5 to 6 degrees C. (9 to 11 degrees F.). Determination was made of the temperatures during setting of concrete in proximity to a loose sand layer cooler by brine running through coils. The apparatus is shown in plan in Figure III. The frozen sand wall contains a thermometer at 1. Other thermometers are shown by Nos. 2, 3, 4, 5, ten centimeters apart in the concrete. This experiment was made with blast furnace cement and to ascertain the effects on the setting of concrete in freezing pits. Figure IV shows a photograph of the 30 cm. cube of concrete with recording thermometers in place. Figure V shows the results of this experiment. The different lines indicate the temperatures of the various zones. R. Grün (Zement, September 20, 1928).

The Mechanism of the Setting and Hardening of Cement

I. The reaction. (1) At least one constituent of cement must be unstable in a system containing a liquid phase, and it dissolves in the liquid phase. (2) A solution supersaturated with respect to the stable compound then forms. (3) When a new solid phase separates from the supersaturated solution, it absorbs some constituents of the liquid phase. Consequently the growth of the particles of the solid phase is hindered by the adsorbed film and there can be no particles of colloidal size. (4) When the supersaturated solution separates a new solid phase, the unstable constituents dissolve anew. Therefore particles of the new phase continue to form as long as conditions permit.

II. Development of strength: Maeda believes that the particles separated from the liquid phase do not have a reciprocal attraction but are united by adsorbed films. When cement is pulled apart the break can occur (1) in the adsorbed film, (2) in separated particles, (3) at the interface between adsorbed film and particle. Beside the relation of atomic arrangement in the particle to the direction of traction, the thickness of the adsorbed film is of special importance. If the distance between particles is not molecular and there is a capillary space filled with liquid phase, the strength of the cement will be small. Factors necessary for strength are: (1) Particles separated from the solution must be very small; i. e., the area of interfaces must be very great. (2) The particles must be separated by an adsorbed film of molecular thickness; i. e., there must be no free liquid phase. (3) The reciprocal attraction between particle and adsorbed film must be large. (4) The strength of the particles must be large. S. Yamane, in the author's laboratory, has obtained an opalescent suspension of apparently colloidal particles by shaking lg. powdered hardened portland cement with 5 cc. glycerol and 30 cc. absolute alcohol, heating and filtering; no such result was obtained from the original cement. Tutomu Maeda.

Strengthening Concrete with Sulphur

Tests carried out on concrete impregnated with sulphur, showed in some cases an increase in tensile strength of from 151 to 2,000 lbs. per sq. in. and compressive strengths up to 9,641 lbs. per sq. in. were obtained. Creosoting cylinders may be adapted for use with sulphur. The cause of the increased strength may be the contraction of the sulphur on solidifying. Impregnated concrete is not so fire resistant as untreated, but the fire hazard is very slight. No satisfactory method of treating existing structures has yet been devised.

Synthetic Gypsum as Insulator

Hot solutions of lime and sulphuric acid are mixed together. The wet mixture rapidly solidifies, is molded in forms at once. After a few minutes, the forms may be removed, the masses dried. In this way exceedingly porous blocks are obtained which make excellent insulators. They have a specific gravity of only 0.35 and less. J. & H. Sckeidemandel (German Patent 461, 889).

Shaft Kiln for Cement or Lime

Above the burning zone is a free space which serves as preheater and acid (CO_2) removing chamber. Under the burning zone, a middle wall is designed in such a manner that the sintering goods are forced to take a zigzag course in falling to the bottom, resulting in a longer interval in the sintering zone and a more favorable operation. E. Meier (German Patent 460, 846).

Properties of Aluminous Cement

A rapid hardening, with great crushing strength, one part of cement with three parts aggregate reaching a strength of 500 kg. per sq. cm. in 40 hours, characterizes aluminous cement. It is possible to pour aluminous cement at temperatures well below freezing, and well below those which may be used for portland cement for the reason that aluminous cement liberates a great amount of heat during setting. Aluminous cement is unchanged by atmospheric influences, sea water, solutions of sodium chloride, sugar solutions, as well as vegetable oils. The possible industrial applications are at once discernible. Used for road paving, the road may be opened for traffic 40 hours after the concrete has been poured. In construction work, the forms may be removed in 40 hours, resulting in an enormous saving in lumber over the ordinary working with portland cement. For any use which interrupts traffic, use of aluminous cement makes this interruption brief as possible. As the crushing strength of the aluminous cement is much greater than that of portland, the size of the pieces or section may be considerably reduced. In using ordinary portland cement in sea water, puzzolana is added to increase the resistance to chemical action but only with partial success. Aluminous blocks under sea water for 12 years, show no alteration whatever. One of the best examples of the application of aluminous cement is that in a tunnel in France which passed through ground containing much gypsum. The resistance of aluminous cement to the action of calcium sulphate in solution has been found to be quite satisfactory. Portland cement cannot resist sugar solutions due to the formation of calcium sucrate. Aluminous cement does not show this effect. Portland cement, due to its content of free lime saponifies vegetable oils, and consequently does not resist their action. Anon. (Le Ciment, Sept., 1928.)

Setting and Hardening of Cement

Four processes are involved in the setting and hardening of cement. These are the dissolution of an unstable solid phase in a liquid phase, the formation of a solution supersaturated with regard to the stable solid phase, the separation of a new stable solid phase, in particles of colloidal dimensions, which may absorb certain constituents of the liquid phase, and the dissolution of further quantities of the unstable solid phase in the solution saturated with regard to the stable phase. The tensile strength of set cement depends to a large extent on a film of solution adsorbed upon the precipitated particles of the stable solid phase. T. Maeda (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1928, 8, Suppl. 5-7). B. C. A.

Recognizing Mixed Cements

Natural cement can be recognized by its high loss on ignition which is 7—9 per cent, most of which is CO_2. Unmixed portland cement exhibits, under a quartz lamp (ultra violet light), velvet brown to brownish black or a dark brown violet fluorescence, mixed cements, consisting of portland cement and blast furnace slag shows a non-uniform aspect under ultra-violet light, spots of light and spots of dark blue violet particles. The deep cocoa brown velvet soft fluorescence of pure portland cement is made lighter by admixture with the slag and passes through light brown to light red-violet with pure blast furnace slag. P. Herrmann (Zement, September 20, 1928).

Manufacture of Cement

Colored (e. g., ferruginous) raw ground materials are mixed with suitable amounts of decolorising substances, such as borax, together with a flux (but excluding alkali or—alkaline-earth chlorides), and then sintered, or melted and granulated, and further treated to form cement. By the further addition of a reducing agent, such as coke, to the raw materials, or by calcining in a reducing atmosphere, iron compounds are reduced and the mass is magnetically treated, after coarse and fine grinding, to remove the metal. The raw materials may be treated individually by the process before mixing. Amme-Luther Werke Braunschweig der "Miag" Mühlenbau u. Ind. A. G. (B. P. 284, 294, 27. 1. 28. Ger. 27. 1. 27). B. C. A.

High Tensile Strength of Gypsum Cement

The tensile strength of gypsum cements is doubled by the addition of ethyl or methyl alcohol to the mixture of gypsum and water. Gypsum warmed to 120 degrees in an oil-bath so that the resulting product has the composition $CaSO_4O$ $.24H_2O$, yields a cement of greater tensile strength than without preheating, whilst a product of about the same water content obtained by heating to a higher temperature yields a product of inferior strength. T. Maeda (Sci. Papers Inst. Phys. Chem. Res. Tokyo, 1928, *8*, Suppl. 8-9). B. C. A.

Acid-Proof Cements and Masonry

To acid-proof cements, prepared as previously described, may be added 2-4 per cent of neutral material, other than silicon, silicon alloys, and fluosilicates, capable of reacting with alkalis to yield products more or less insoluble in acid, e. g., tungistic acid, cryolite, or slats of fluozirconic, fluogermanic, hydrofluoric, fluotitanic, fluotantalic fluoniobic, and fluostannic acids. I. G. Farbenind. A.-G. (B. P. 283,471, 9. 1. 28. Ger. 8. 1. 27. Addn.)

Paving and Highway Conditions Studied by Commission

The following article is an abstract of the report of the investigations of paving and general highway conditions by the engineering commission appointed by the National Paving Brick Manufacturers' Association. This committee is composed of the following highway engineers: William H. Connell, consulting engineer, chairman, formerly head of the Pennsylvania State Highway Department; Warren R. Neil, Chief State Highway Engineer of Georgia; Perry J. Freeman, Chief Engineer Bureau of Specifications and Tests, Allegheny County, Pittsburgh, Pennsylvania; and Frederick J. Cellarius, consulting engineer, former city engineer, Dayton, Ohio.

This investigation embraced conferences and correspondence with United States Government, State, City, County, Borough and Township officials throughout the country, a comprehensive study of technical literature on paving, and a general field inspection of typical paving conditions in the Southern, Middle Atlantic, New England, and Eastern and Western Central States. The object of the investigation was to secure an up-to-date picture of the highway business, especially the paving brick situation, throughout this territory. The report discusses the engineering and economic principles that should govern highway construction as well as the types of road surfacing and pavements applicable to the different traffic, social, local, climatic and sub-soil conditions. Included also is a general discussion of the paving brick situation as well as results of special tests and investigations and recommendations of specifications and methods of construction of brick pavements. The report also states that paving programs, particularly the higher types of pavement, including both new construction and reconstruction, will grow larger each year as the traffic increases.

Total highway expenditures are placed in this report at about $2,000,000,000 a year, of which about $400,000,000 is wasted due to incompetent supervision. The employment of only trained highway engineers is stressed as being necessary to eliminate this waste. Specifications, it is said, are generally of high standards, but in many localities these are not followed and the result is poor work. State highway systems are maintained in good condition, the average county roads are average, the borough and township roads are generally poor, and the maintenance in the cities varies from good to poor, according to the committee.

The three outstanding causes of poor pavements are: Lack of control over construction; inadequate foundation; lack of proper provision to remedy poor sub-soil conditions. The first of these is the outstanding cause of poor pavements and can only be corrected by divorcing politics from highway work, which is a problem that highway users must solve. The other two are up to the engineers.

The report further states that the economic road surfacing or pavement may under different conditions vary from a dirt road to a high quality unit type pavement on a concrete foundation. Pavement of a high type where there is an appreciable amount of heavy traffic will show the least annual cost over a period of years. This is due to the fact that a long life pavement will outlast several less durable pavements and will reduce operating costs due to reconstruction and repairs which would be necessary.

A large portion of the report is devoted to a discussion of types of pavement using brick or concrete blocks, including a number of advantages, as well as results of investigations and tests conducted in various parts of the country. Old brick pavements which have proved unsatisfactory are said to be almost entirely due to the following causes: Poor construction; either no foundation, or one inadequate for the traffic; poor sub-soil conditions, undesirable specification requirements, such as monolithic construction, grout fillers, and thick sand cushions. Great stress is laid on the necessity of an adequate foundation.

The accomplishments of the committee appointed by Herbert Hoover on simplification of varieties and sizes of vitrified paving brick are also referred to and commended. Through this committee the number of varieties and sizes were reduced from sixty-five to five.

Huge Capital Yield

Interest and dividend payments in the United States this year total $4,336,600,000. This is the amount of return upon their capital received by investors from principal sources in the first three quarters, reports to the U. S. Census Bureau indicate.

Payments in 1928 are greater by 6.7 per cent, it is found, than in the corresponding period of 1927, when the amount was $4,065,750,000. They exceed by 34.8 per cent the 1926 total of $3,216,830,000.

In 1925 earnings of capital received in the three quarters January to September aggregated $3,025,840,000. In 1924 they were $2,840,770,000. The total for 1923 was $2,654,990,000; in 1922 it was $2,449,000,000 and in 1921 it was $2,438,030,000.

Interest paid in 1928 amounts to $2,699,000,000, it is shown, and dividends to $1,637,600,000. This is an increase of 6.1 per cent in interest payments compared with $2,543,270,000 paid in 1927, and a 7.6 per cent gain over the amount of dividends, $1,522,480,000, paid that year.

INTIMATE NEWS OF MEN AND PLANTS

Oregon Granite Company Reorganizes

The newly reorganized Blair Granite Company of Ashland, Oregon, expects to resume operations in a short time. New machinery is to be purchased and all operations will be expanded.

Illinois Company Purchase Property

The Clay and Stone Manufacturing Company of Matherville, Illinois, recently purchased several acres of land adjoining the present property in that city.

California Rock Company Organizes

The San Leandro Rock Company of San Francisco, California, was recently organized to quarry rock with a capitalization of $100,000, all of which is held by directors of the company.

Atlas Elects A. J. Forschner

The Atlas Conveyor Company, Inc., Philadephia, Pennsylvania, announces that A. J. Forschner, who joined the company in July of this year as Vice President, has also taken over the duties of Secretary for the company. This position was formerly held by E. A. Thumlert, who is no longer connected with the company.

Michigan Gravel Plant Sold

The Marlette Sand and Gravel Company has taken over the leases and equipment of Cargill and Westover at Marlette, Michigan. The new owners are incorporated at $30,000 and expect to begin production immediately.

Harold M. Power Joins Cebu Portland Cement Company

Harold M. Power, superintendent of the Pacific Portland Cement Company plant at Redwood Harbor, California, since its construction several years ago recently resigned his position to become general manager of the Cebu Portland Cement Company at Cebu, Philippine Islands. Mr. Power has been connected with the Pacific Portland Cement Company in various capacities since 1910. He enlisted during the World War as a lieutenant in the 20th Engineers and went to France where he became a captain before the Armistice was signed. M. J. Johnson of Cement, California, has been appointed as his successor.

Texas Graphite Plant In Operation

The Southwestern Consolidated Graphite Company recently completed its new plant near Burnet, Texas. This plant, which has a capacity of 500 tons per ten hour day, replaces the old plant which was destroyed by fire in 1927. The flotation method of separating graphite is used.

The graphite deposit is being worked as an open pit and is a mile long and from 100 to 150 feet wide. Steam shovels load the material from the pits into motor trucks with dump bodies which transport it to the plant.

Botfield Appoints Tierney Southern Representative

Botfield Refractories Company, Philadelphia, Pennsylvania, manufacturers of adamant fire brick cement, adamant-adachrome and the adamant gun, announces the appointment of W. E. Tierney as its representative in the South and Southwest. Mr. Tierney, who is a mechanical engineer and a graduate of Tulane University, will have offices in New Orleans.

Common Minerals of Texas

The Bureau of Economic Geology of the University of Texas has prepared and is distributing a brief index of the common minerals and mineral products of Texas together with notes on their occurrences and uses. Of the more than 100 minerals listed, 20 are commercially utilized, according to the bulletin, and 16 are included in a table of production as of 1925. This table gives the value of the products which totals, for 1925, $350,036,589.00.

Concrete Block Manholes and Catch Basins

The Portland Cement Association is distributing a pamphlet describing manholes and catch basins of radial concrete block. These blocks are endorsed by leading sanitary engineers and are specified in many municipalities. Each of these blocks replaces from 10 to 12 bricks and their use results in a 60 per cent saving in labor costs and 60 to 80 per cent in mortar.

These units are made so that when laid they form a true circle and are standard in 30, 36, 42 and 48 inch inside diameters. They are usually six inches thick and 6 or 8 inches high and are so designed that only full length units are required for standard structures. The ends of the units are plain or of the tongue and groove type where closed vertical joints are desired.

Construction methods are very similar to those used for brick, a concrete base being placed before laying the blocks. Openings for traps and inlet or outlet pipes are made in the walls of the structure by using special block or by cutting standard units to fit. Tentative specifications of the American Concrete Institute covering strength requirements, absorption, sampling and testing of these blocks are included.

Atlas Portland to Build New Texas Plant

The Atlas Portland Cement Company, with headquarters in New York City, has purchased 500 acres of land about eight miles west of Waco, Texas, and will erect its first Texas plant on this property. The Atlas Portland Cement Company of Texas, with a capital of $2,000,000, recently incorporated for this purpose. The land was purchased for approximately $51,000 and the remainder of the capital will be invested in buildings and equipment.

Construction is to begin in the near future, a 1,500 foot artesian well having already been drilled for water supply. All of the materials required for cement manufacture will be supplied from the property, except gypsum which will be shipped from another of the company's plants in Oklahoma. Nat Harris of Waco is resident attorney for the company.

New California Plant In Operation

The Roseville Sand Company recently completed its new sand and gravel washing and screening plant on Dry Creek near Roseville, California. The plant has a capacity of 50 tons per hour. A rock crusher and concrete mixer will be installed later so that ready mixed concrete can be delivered for construction work in the vicinity.

DISTRIBUTION OF CEMENT

The following figures show shipments from Portland cement mills distributed among the states to which cement was shipped during July and August, 1927 and 1928.

Portland cement shipped from mills into States in July and August, 1927 and 1928, in barrels

Shipped to—	July		August	
	1927	1928	1927	1928
Alabama	207,386	267,843	243,841	315,341
Alaska	2,029	1,496	338	382
Arizona	38,125	42,336	34,598	57,033
Arkansas	72,502	123,490	85,164	150,173
California	1,077,710	1,081,470	1,158,661	1,166,958
Colorado	113,490	113,414	124,628	147,267
Connecticut	258,232	266,888	239,392	279,641
Delaware	18,765	35,077	40,815	29,447
District of Columbia	105,400	87,606	103,217	83,553
Florida	166,647	97,376	180,328	105,108
Georgia	179,713	135,770	193,713	181,254
Hawaii	34,500	21,832	28,219	25,413
Idaho	28,166	40,823	30,000	45,284
Illinois	1,962,942	2,321,485	2,066,172	2,581,921
Indiana	771,651	712,107	868,669	804,868
Iowa	486,109	873,528	602,653	813,328
Kansas	263,430	215,125	251,022	233,127
Kentucky	239,555	192,746	283,184	216,674
Louisiana	147,449	113,049	147,709	125,319
Maine	82,034	63,915	81,018	71,721
Maryland	272,142	246,605	366,046	260,189
Massachusetts	290,232	334,822	314,527	308,837
Michigan	1,360,516	1,540,219	1,788,820	1,707,324
Minnesota	419,976	435,564	480,599	401,260
Mississippi	102,252	90,937	111,007	122,486
Missouri	481,281	484,207	560,364	541,927
Montana	39,521	58,225	50,776	66,954
Nebraska	150,181	110,938	180,063	127,833
Nevada	10,139	10,535	6,149	14,101
New Hampshire	50,796	46,025	56,223	69,903
New Jersey	844,190	861,340	853,588	878,977
New Mexico	18,160	36,795	23,750	43,079
New York	2,467,699	2,480,799	2,749,722	2,774,981
North Carolina	321,348	221,912	340,093	218,950
North Dakota	71,813	72,490	69,872	61,931
Ohio	1,166,296	1,313,568	1,381,581	1,549,784
Oklahoma	287,638	285,643	298,452	286,023
Oregon	187,401	140,619	188,586	175,733
Pennsylvania	1,573,559	1,437,571	1,706,430	1,699,137
Porto Rico	3,000	.....	3,500	.....
Rhode Island	69,599	68,980	85,312	71,291
South Carolina	63,414	149,917	103,455	152,387
South Dakota	50,896	61,429	50,994	62,440
Tennessee	269,184	288,860	285,835	323,794
Texas	436,475	601,154	533,591	690,901
Utah	41,478	58,462	60,332	65,376
Vermont	45,365	64,211	67,255	103,293
Virginia	195,133	183,762	211,679	214,602
Washington	299,400	361,159	335,681	408,566
West Virginia	194,693	151,406	239,578	166,289
Wisconsin	858,526	812,237	1,035,131	809,545
Wyoming	20,374	21,154	22,131	30,976
Unspecified	29,843	2,209	23,887	30,779
	18,948,355	19,841,130	21,348,350	21,873,450
Foreign Countries	35,645	59,870	62,650	96,550
Total shipped from cement plants	18,984,000	19,901,000	21,411,000	21,970,000

Production, shipments, and stocks of finished Portland cement, by months, in 1927 and 1928. (In thousands of barrels)

Month	Production		Shipments		Stocks at end of month	
	1927	1928	1927	1928	1927	1928
January	8,258	9,768	5,968	6,541	22,914	25,116
February	7,377	8,797	6,731	6,563	23,563	27,349
March	11,450	10,223	11,100	10,135	23,922	27,445
April	14,048	13,468	14,350	13,307	23,654	27,627
May	16,701	17,280	16,865	18,986	23,503	25,984
June	17,224	17,469	19,761	18,421	20,972	25,029
July	17,408	17,445	18,984	19,901	19,397	22,580
August	18,315	18,730	21,411	21,970	16,292	19,328
September	17,505	17,856	19,828	20,462	13,996	16,722
October	17,174	.....	18,105	.....	13,141	.....
November	14,449	.....	11,619	.....	16,022	.....
December	11,999	.....	6,200	.....	22,082	.....
	171,908	.....	170,922	.....	.....	.....

Relation of Production to Capacity

	September		August	July	June
	1928	1927	1928	1928	1928
	Per cent	Per cent	Per cent	Per cent	Per cent
The month	91.7	92.3	93.1	87.0	90.1
The 12 months ended	73.7	72.3	73.5	73.7	73.8

Production and stocks of clinker, by months, in 1927 and 1928. (In thousands of barrels)

Month	Production		Stock end of month	
	1927	1928	1927	1928
January	10,410	11,839	9,989	9,672
February	9,253	11,363	11,943	12,237
March	12,397	12,501	12,997	14,463
April	14,246	13,844	13,335	15,002
May	15,677	16,025	12,514	14,329
June	15,437	15,940	10,926	12,944
July	15,697	15,981	9,609	11,707
August	16,396	16,202	7,887	9,357
September	15,931	15,909	6,490	7,589
October	16,469	.....	5,960	.....
November	14,698	.....	6,374	.....
December	13,177	.....	7,660	.....

CEMENT STATISTICS FOR SEPTEMBER

The Portland cement industry in September, 1928, produced 17,856,000 barrels, shipped 20,462,000 barrels from the mills, and had in stock at the end of the month 16,722,000 barrels, according to the United States Bureau of Mines, Department of Commerce. The production of Portland cement in September, 1928, showed an increase of 2.0 per cent and shipments an increase of 3.2 per cent, as compared with September, 1927. Portland cement stocks at the mills were 19.5 per cent higher than a year ago. The total production for the nine months ending September 30, 1928, amounts to 131,036,000 barrels, compared with 128,286,000 barrels in the same period of 1927, and the total shipments for the nine months ending September 30, 1928, amount to 136,286,000 barrels, compared with 134,998,000 barrels in the same period of 1927.

The statistics here presented are compiled from reports for September from all manufacturing plants except two for which estimates have been included in lieu of actual returns.

In the following statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 159 plants at the close of September, 1928, and of 152 plants at the close of September, 1927.

Georgia Quarry Planned

The Godfrey Marble and Tile Company, Atlanta, Georgia, plans to quarry travertine in Randolph county, near Cuthbert. Machinery will be installed and the rough stone hauled by truck to the Atlanta plant for finishing until the 4 mile spur track from the quarry to the G. F. and A. railroad is completed. Lime for agricultural purposes will be another product.

Washington Chemical Deposits To Be Mined

The 99 Mining Company, Seattle, Washington, has leased the chemical deposits in the lakes east of Monse, Washington, from the Naso Chemical Company. The deposits, which consist largely of sodium sulphate, will be mined and transported to a warehouse at Okanogan. A pulverizing plant will also be built, according to R. Stenswick, president of the company.

New Incorporations

National Portland Cement Co., H. J. Harris, 4425 Normandy St., Dallas, Tex. 150,000 shares n. p. v.

Kentucky Cement Corp., Frankfort, Ky. New corp. $2,500,000. F. B. Drew, Pres., McAlester, Okla.; W. D. McCammish, Sec., Frankfort, Ky.

Soapstone Products, Inc., Asheville, N. C. 100 shares n.p.v. Robert S. Brown, Hugh C. Brown, Edwin L. Brown.

Little Flower Mining Co., Logan, Utah. $25,000. Frank Cook, Engr.-Director; F. X. Grubl, E. M.; W. R. Huntsman, Sec.-Treas.

Arbor Manor Co., Jackson, Mich. $30,000. Will produce crushed stone. Frank T. Bennett, 34 Sun Bldg.; Ben H. Price, Ray A. McQuillan.

Anchor Stone Co., Tampa, Fla. $25,000. O. H. Welch, C. S. Robinson, W. C. Brooker.

Winchester Quarries, Inc., Boston, Mass. 100 shares n.p.v. Luther Hill, Pres.; Frederick P. Hanford, Treas., 318 Sumner St., Somerville, Mass.

Blue Mining Co., Blue Mountain, Miss. $375,000. Will develop 1,000 acres of paint rock field. Albert C. Anderson, Pres., Ripley; G. A. Hazzard, Corinth.

St. Louis Rock Sand & Gravel Co., 705 Olive St., St. Louis, Mo. 500 shares n.p.v. Emmett Williams, M. C. Hann, D. M. Drouet. Attorney, Edward I. Siegel, 705 Olive St.

Gemmer-Tanner Co., Post Dispatch Bldg., Houston, Tex. $300,000. Will build gravel plant at Calhoun & Dowling Sts.

Morrison Gravel Co., Charleston, Miss. $30,000. W. V. Morrison, Julian K. Morrison, L. W. Morrison, R. M. Morrison, T. B. Wilson.

General Asphalt Corp., H. J. Wilson, 227 Rosemary Ave., Route 2, Box 376-B, San Antonio, Tex. $100,000. D. A. Gregg, 812 W. 10th St., Austin, Tex. Plant near Uvalde, Tex.

Madison Shale Brick Co., Madison, N. C. $200,000. E. L. Hedgecock, Pres., Martinsville, Va.; J. A. Hedgecock, V. P.; J. W. Stanley, Jr., Sec.-Treas.; both of Madison.

North Granite Mining Co., Phillipsburg, Mont. $250,000. H. O. Flickinger, John Hickey, John Ingman, R. E. McHugh, Chas. J. Hydel.

Piedmont Quarry Co., Salisbury, N. C. $50,000. Bought C. M. Thomas & Co. quarry near Winston-Salem, N. C. M. N. and T. E. Hedrick, Thos. White.

International Marble Corp., % Hornblower, Miller & Garrison, 15 Broad St., New York City. 200,000 shares n.p.v.

(*Continued on page 89*)

EXPORTS AND IMPORTS

Compiled from the records of the Bureau of Foreign and Domestic Commerce and subject to revision.

Exports of hydraulic cement by countries in August, 1928

Exported to—	Barrels	Value
Canada	3,801	$ 20,300
Central America	12,700	41,654
Cuba	6,633	19,209
Other West Indies and Bermuda	1,426	5,284
Mexico	5,658	17,490
South America	51,757	156,981
Other countries	6,761	41,948
	88,736	302,866

Imports of hydraulic cement by countries, and by districts, in August, 1928

Imported from—	District into which imported	Barrels	Value
Belgium	Florida	2,000	$ 2,334
	Galveston	11,822	15,199
	Massachusetts	29,834	39,278
	New York	22,500	26,716
	North Carolina	23,770	41,597
	Oregon	3,000	3,794
	Philadelphia	54,597	78,364
	San Antonio	6,000	6,122
	South Carolina	38,115	46,595
	Virginia	600	664
	Washington	3,000	4,308
	Total	195,238	264,971
Canada	Maine and New Hampshire	8,430	18,313
Denmark	New York	9,042	9,500
	Porto Rico	34,706	48,101
	Total	43,748	57,601
France	New York	500	1,006
Germany	Chicago	13	387
	Los Angeles	1,001	2,454
	New York	224	310
	Total	1,238	3,151
United Kingdom	New York	2,899	4,549
	Philadelphia	7,935	9,267
	Total	10,834	13,816
	Grand Total	259,988	358,858

Exports and imports of hydraulic cement, by months, in 1927 and 1928

	Exports				Imports			
	1927		1928		1927		1928	
Month	Barrels	Value	Barrels	Value	Barrels	Value	Barrels	Value
January	75,346	$ 254,072	56,400	$204,875	193,175	$ 269,661	234,753	$342,797
February	71,404	233,985	62,828	221,620	130,421	200,680	164,408	217,525
March	67,956	240,165	74,983	265,719	181,145	261,519	235,930	330,074
April	72,383	243,832	61,676	205,882	192,318	313,262	249,458	324,371
May	59,332	205,574	70,173	236,005	178,929	263,618	190,509	256,872
June	69,205	237,281	59,536	201,313	129,111	201,682	266,537	359,637
July	72,337	249,737	83,759	291,055	175,042	249,665	112,887	151,877
August	61,371	209,198	88,736	302,866	117,605	170,167	259,988	358,858
September	57,890	207,817	.....	.....	233,066	304,796	.....	.....
October	67,639	230,668	.....	.....	221,274	321,777	.....	.....
November	79,764	257,428	.....	.....	141,485	190,419	.....	.....
December	62,099	226,960	.....	.....	156,609	209,205	.....	.....
	816,726	2,796,717	.....	.....	2,050,180	2,956,451	.....	.....

Domestic hydraulic cement shipped to Alaska, Hawaii, and Porto Rico, in August, 1928

	Barrels	Value
Alaska	1,317	$ 3,984
Hawaii	26,685	64,011
Porto Rico	3,503	8,691
	31,505	76,686

Production and stocks of clinker (unground cement) by districts, in September, 1927 and 1928. (In thousands of barrels)

	Production		Stocks at end of month	
District	1927	1928	1927	1928
Eastern Pennsylvania, New Jersey and Maryland	3,792	3,280	772	1,296
New York and Maine	1,197	1,101	283	706
Ohio, Western Pennsylvania and West Virginia	1,596	1,748	667	791
Michigan	1,324	1,260	628	758
Wisconsin, Illinois, Indiana and Kentucky	2,125	2,073	385	320
Virginia, Tennessee, Alabama, Georgia, Florida and Louisiana	1,478	1,401	727	826
Eastern Missouri, Iowa, Minnesota and South Dakota	1,375	1,519	424	430
Western Missouri, Nebraska, Kansas and Oklahoma	874	1,095	264	398
Texas	469	557	168	149
Colorado, Montana and Utah	167	309	487	292
California	1,215	1,201	1,348	1,273
Oregon and Washington	319	365	337	350
	15,931	15,909	6,490	7,589

Indiana Quarry in Operation

The new oolitic limestone quarry three miles northwest of Bloomington, Indiana, owned by Bert G. Hoadley, is now in operation.

Barite and Barium Products in 1927

Sales of crude barite in 1927, as reported to the United States Bureau of Mines, Department of Commerce, by domestic producers, amounted to 254,265 short tons, valued at $1,670,878. These totals indicate an increase of 7 per cent in quantity and a decrease of 6 per cent in value of sales, as compared with 1926.

Of the crude barite, both domestic and foreign, consumed in the manufacture of barium products, 65 per cent was used in lithopone, 24 per cent in ground barite, and 11 per cent in barium chemicals. Foreign crude barite imported for consumption in this country in 1927 amounted to 70,274 short tons, valued at $253,284.

Combined sales of the barium products—ground barite, lithopone, and barium chemicals—by domestic producers amounted to 258,595 short tons, valued at $19,847,908, in 1927. As compared with 1926, sales of barium chemicals combined increased 9 per cent in quantity and sales of lithopone increased 11 per cent, and sales of ground barite decreased 0.27 percent.

The lithopone industry is now represented in Illinois and the Middle Atlantic States and on the West Coast at Oakland, California. Missouri remains the center of the ground barite industry.

Massachusetts Granite Quarry Planned

The Chester Granite Company of Chester has acquired the property formerly owned by Bisbee Brothers near Chesterfield, Massachusetts, consisting of 158 acres of land, and intends to open a granite quarry. A new plant will also be built at Chesterfield.

Florida Plant Reopens

The Florida Portland Cement Company recently resumed operations at the Hooker's Point plant near Tampa, Florida. One kiln was started on October 1, and a second will start as soon as the demand necessitates it. The plant, which has three kilns, is expected to operate indefinitely.

Plan New Cement Plant For Pennsylvania

The Davison Coke and Iron Company, which recently acquired the Neville furnace of the American Steel and Wire Company located at Neville Island, Pennsylvania, is erecting a by-product coke plant and power house as well as a cement plant. Power plant and mill machinery has already been ordered and orders for cement mill equipment are to be placed soon.

New Indiana Pit

Milo McCollum and son Raymond are opening a new gravel pit on the W. D. Cross farm south of Geneva, Indiana.

Michigan Peat Beds To Be Developed

The Kendall Peat Company has been formed to take peat from marsh lands west of Kendall, Michigan. The Thrall and Urquheart Company of Detroit is financing the project.

New California Plant Near Completion

The California Rock Company of Centerville, California, recently received a shipment of machinery, including a crane, to be installed in its plant. Actual working of the gravel beds along Alameda creek is to begin in the near future, according to Lee Frontz, superintendent.

Georgia Lime Plant Resumes

The Puntenney Lime Company of Puntenney, Georgia, has resumed operation of its plant and is now running at half capacity with an output of 200 barrels of lime per day. John Sheffield is general manager.

Illinois Plant to Improve

The Ebert Sand and Gravel Company is now producing 8 cars of gravel per day from the plant near Farmdale, Illinois. A working, crushing and screening plant will be installed next spring as well as machinery and storage bins.

Utah Magnesium Plant To Be Built

The Little Flower Mining Company, recently incorporated, is to begin the extraction of magnesium from dolomite lime and carbonate ore in Green Canyon near Logan, Utah. Extraction is to be by a patented process and a plant with an initial capacity of 50 tons of ore daily will be built at a cost of $25,000. Several by-products will also be produced.

F. X. Grubl, mining engineer, is president of the company, W. B. Huntsman is secretary-treasurer, and Frank Cook is engineer.

Vermont Marl Deposit To Be Opened

Professor E. Van Alstine of the University of Vermont and Guy D. Hawkins, Chelsea, Vermont, are interested in the development of a marl deposit on a farm near Tunbridge belonging to Judge Stanley C. Wilson. Equipment has been installed and work is to begin soon.

Crude Barite Sold by Producers in the United States, 1926-27

	1926			1927		
State	Short tons	Value Total	Per ton	Short tons	Value Total	Per ton
Georgia	77,654	$ 532,706	$6.86	94,039	$ 580,300	$6.17
Missouri	118,919	946,595	7.96	111,456	797,465	7.15
Tennessee	20,910	155,780	7.45	20,537	129,999	6.33
Other States[2]	[1]20,392	[1]138,212	6.78	28,233	163,114	5.78
	237,875	1,773,293	7.45	254,265	1,670,878	6.57

[1]Revised figures.
[2]1926: Arizona, California, Illinois, Kentucky, Nevada, South Carolina and Wisconsin; 1927: California, Nevada, South Carolina, Virginia and Wisconsin.

Barium Products Sold by Producers in the United States, 1926-27

	1926			1927		
Product	Short tons	Value Total	Per ton	Short tons	Value Total	Per ton
Ground barite	57,812	$ 1,186,563	$ 20.52	57,658	$ 1,166,294	$20.23
Lithopone	159,931	16,062,197	100.43	176,994	17,163,620	96.43
Barium chemicals:						
Carbonate	5,394	298,121	55.27	5,969	313,613	52.54
Chloride	4,592	279,510	60.87	3,708	213,446	57.56
Other[1]	11,925	747,631	62.69	14,266	990,935	69.46
	239,654	18,574,022	....	258,595	19,847,908	....

[1]1926: Hydroxide, sulphate, and sulphide; 1927: binoxide, hydroxide, sulphate, and sulphide.

Tennessee Firm Moves

The Wolf River Sand and Gravel Company has moved its offices in Memphis, Tennessee, from its old location on the sixth floor of the Falls Building to suite 520 in the same building.

Illinois Firm Expands

The Material Service Corporation of Chicago, Illinois, distributors of gravel, stone and sand, recently purchased from the Calumet Trust a 7½ acre dock site on the Calumet River at 92nd Street and Ewing Avenue.

Pennsylvania Gypsum to Build

The Pennsylvania Gypsum Company, Philadelphia, Pennsylvania, has completed plans for the construction of a pier and the installation of conveying and hoisting equipment for handling gypsum rock at its plant at Chester.

Alabama Plant to Rebuild

The Kaolin Brick Company of Columbus, Georgia, will rebuild its plant at Kaolin, Alabama, which was recently partially destroyed by fire. J. Dudley Eason is president and manager.

United Talc Begins Shipment

The United Talc and Crayon Manufacturing Company of Glendon, North Carolina, announces that its plant is almost completed. Grinding and shipping of talc and soapstone will begin about November 1.

Wisconsin Quarry Resumes

The American Black Gabbro Company has been formed with a capital stock of $1,500,000 at Mellen, Wisconsin, and plans to develop the black gabbro quarry owned by Julius and Rudolph Effenberger. A railway is being laid in the quarry and a new 50 ton steam crane has been purchased. A finishing plant will be erected and the quarry enlarged.

Babcock and Wilcox Build New Refractories Plant

The Babcock and Wilcox Company is constructing a refractories plant at Augusta, Georgia, which will use a kaolin deposit near Hephzibah. The plant, which will cost about $600,000, is being built on a 16 acre tract of land and will be completed early next year. H. L. Tucker is manager and J. Norman Hawes, constructing engineer.

District of Columbia Plant Recently Completed

The new loading and handling plant of the Massaponax Sand and Gravel Corporation, Washington, D. C., was recently completed. This plant consists of five circular steel bins with a capacity of 400 tons each. Loading into the bins is done by a belt conveyor and the material is unloaded into trucks through gates or measuring hoppers, allowing the material to be shipped by truck load or batch as conditions require. Davis and Averill, Inc., of Newark, New Jersey, engineers and contractors, designed, furnished, and built the plant.

California Plant to Enlarge

The Imperial Rock Company is to begin work immediately on enlarging the plant at Frink, California. Additional machinery will also be installed, according to W. F. Blaikie, general manager, who will be in charge of the work.

New Kentucky Cement Plant Under Way

The Kentucky Cement Corporation, capitalized at $2,500,000, within a month will begin the construction of a new plant at the Forks of Elkhorn near Frankfort, Kentucky. The plant will be built at an expense of about $2,500,000 and will have a capacity of 1,500,000 barrels of cement annually. It is expected to be completed by next spring. The site was formerly occupied by a distillery and is excellently located as to materials, labor, railroad and river facilities.

F. B. Drew of McAlester, Oklahoma, is president of the corporation and W. D. McCammish is secretary. The Hunt Engineering Company, of Kansas City, Missouri, is handling all of the engineering details. Machinery and equipment is now being purchased and offices have already been opened in Frankfort. Col. Leigh Hunt of the Hunt Engineering Company and J. B. O'Rear, general manager of the Frankfort and Cincinnati R. R. Company are purchasing the machinery.

Washington Plant Producing

The stone crushing plant of the Weyerhaeuser Timber Company near Hemlock Pass, Washington, is in operation and is turning out from 300 to 400 cubic yards of crushed stone daily. The stone is being used as ballast for logging railways under construction by the company.

(*Continued from page* 87)

Guarino Marble Wks., Belleville, N. J. $125,000.

Arkansas Marble Corp., Little Rock, Ark. 2,000 shares n.p.v. Wm. A. Wall, Lee Y. Casey, Wm. T. Hammock.

Mitchell Bay Lime Co., Bellingham, Wash. $50,000. Attorneys, Troy & Yantis, Olympia, Wash.

Bear Canyon Asbestos Co., Globe, Ariz. $50,000. F. J. Lunn, Frederic A. Shaffer.

Marlime Co., Silver Lake, Cuyahoga Falls P. O., Ohio. 1,000 shares n.p.v. Shale, marl, lime. Mrs. Mary Kerr, Esther Cheesman. Attorney, L. H. Mattern, Third Nat. Bldg., Dayton, Ohio.

Slade Asbestos Corp., % U. S. Corp. Co., Dover, Del. 100,000 shares n.p.v. Chas. H. Scott, 662 Dorian Rd., Westfield, N. J.; Joseph F. Murray, 7 Park Row, Maplewood, N. J.; Mabel E. Palmer, 8 W. 28th St., New York City.

Alpha Portland Moves Birmingham Office

The Alpha Portland Cement Company is moving its Birmingham, Alabama, offices from the Alabama Power building to the sixth floor of the American Traders Bank building.

Florida Travertine Plant Nears Completion

The Florida Travertine Corporation, Bradentown, Florida, has been organized to quarry travertine deposits in Manatee County. The deposits cover about 80 acres and in some places are 100 feet deep. Machinery has been installed and a spur track built from the quarry to the railroad. The plant is now half completed and operations have begun in a small way. Frank A. Howard is general manager.

S. C. McCurdy Retires

S. C. McCurdy, southern sales manager of the Alpha Portland Cement Company, recently retired from active business after having been connected with the cement industry for over 22 years. He retains business interests in Birmingham but plans to build a home near Vista, San Diego County, California, where he owns property.

Charles P. Postelle, formerly assistant sales manager, succeeds Mr. McCurdy. Mr. Postelle had previously been with the Atlas Portland Cement Company in New York, Savannah and Birmingham for nine years.

NEWS OF EQUIPMENT MANUFACTURERS

Trackson Company Appoints Southern Distributors

The Trackson Company, Milwaukee, Wisconsin, announces the recent appointment of the following distributors in southern territories: Dealers Equipment and Implement Company, Box 2281, De Soto Station, Memphis, Tennessee; Evans Implement Company, 569-71 Whitehall Street, Atlanta, Georgia; F-D Equipment Company, 4219 East Grand Avenue, Dallas, Texas; Industrial Tractor and Equipment Corporation, 409 North Fifth Street, Richmond, Virginia; Industrial Machinery Company, 1717 Main Street, Kansas City, Missouri; and Southern Equipment Company, Inc., 501 North Alexander Street, New Orleans, Louisiana.

Reach the Wide Places With Flexible Rail

It is pointed out by the Illinois Power Shovel Company, Nashville, Illinois, that wide places may be easily cleaned up with a single track, if the Clarkson flexible rail is used. This device was originally designed to enable a track mounted machine to clean up a wide room. The rail is composed of small cast steel sections with stop ears attached, which rest in chairs mounted on cross ties. Upon moving the track, the inside sections contract and the outside lets out, forming a uniform curve.

Duplex Conveyors Described

The Boston Woven Hose and Rubber Company, Cambridge, Massachusetts, recently published a supplementary catalog on the Duplex system for conveying materials. Photos and drawings show some of these belt conveyors which have been in use for some time and operating data of each installation is included.

This conveyor differs from the average belt conveyor in that two separate belts are used, the power transmission belt and a separate wear sheet or pad. The former travels over the regular head and tail pulleys in the usual manner while the latter is kept in alignment with the transmission belt by the use of two idler pulleys, one located in front of the head pulley and one at the rear of the tail pulley. The wear sheet is under no working tension, being moved solely by friction contact with the transmission belt, and travels slack on the return run.

The power transmission belt is rubber covered to protect the fabric from grit, moisture, and other deteriorating conditions. The wear sheet is made from pure gum stock with two plies of duck, one located at the bottom face which comes in contact with the transmission belt and the other in the center.

Different thicknesses of wearing sheets and qualities of rubber are made for different needs and belts are made in all widths to suit requirements. Wear sheets with wire inserted asbestos cloth and a specially compounded surface are made for handling hot materials up to 500 degrees F. Thicknesses of 9/32 inches are recommended for hot lime, cement, bone char and slate, and ⅜ inch for hot cement clinker, coke and other coarse abrasive materials.

Other advantages claimed for this system are: That smaller pulleys can be used than in the ordinary conveyor; three pulley type troughing idlers can be used in all cases; the power belt is narrower than the wear sheet allowing the latter to be troughed to a greater extent without causing undue wear on the power belt.

Another small catalog of mechanical rubber goods lists rubber belting, standard conveyor belting, air hose and couplings, cotton and rubber mill hose, suction hose and dredging sleeves, and water hose in all sizes and grades to suit every need. Connections and fittings of all kinds are included.

Spencer S. Swasey Joins Zelnicker Supply

Spencer S. Swasey of Chicago has joined the Walter A. Zelnicker Supply Company and been appointed manager of the equipment department. Mr. Swasey was for 12 years with the George D. Whitcomb Company and for the past three years head of a company.

Heat Insulation in Smelting Non-Ferrous Metals

Silocel insulation is used in many types of metallurgical equipment according to an illustrated 4 page bulletin 102, being distributed by the Celite Products Company of New York City. The purpose of the bulletin is to discuss the use of insulation in the smelting of non-ferrous metals as bulletins covering the use of this product in other fields have been prepared. Silocel is made from a natural mineral that contains millions of cells in a cubic inch. The advantages claimed for its use are reduced fuel costs, more accurate temperature control and uniform heat distribution, reduced firing temperature and air infiltration, improved working conditions and a general increase in simplicity of operations. The illustrations include roasters, precipitators and furnaces being used in the non-ferrous metal industries.

Trackson Company Appoints Minnesota Distributor

The Motor Power Equipment Company, Ford Road and River Boulevard, St. Paul, Minnesota, has been appointed a distributor for the Trackson Company, Milwaukee, Wisconsin, and will handle all Trackson lines of equipment for the McCormick-Deering industrial tractor.

Magnetic Announces Addition to Sales Staff

The Magnetic Manufacturing Company of Milwaukee, Wisconsin, has announced the appointment of George F. Joyce as assistant sales manager for Chicago and vicinity. The office has been moved to new and larger quarters at 720 Cass Street, where information may be obtained on magnetic equipment problems.

Celite Uses Discussed

The Celite Products Company, of Chicago, New York and Los Angeles, is distributing a pamphlet giving information on the use of Celite to insure control of the workability of concrete mixtures used for many different purposes. Much interesting information is presented in the form of laboratory test results and tables compiled from actual field tests. A number of illustrations showing various kinds of concrete work in which Celite was used are included.

Foote Brothers Appoints Sales Representative

Foote Brothers Gear and Machine Company announces the appointment of A. H. Tischer, 704 North Alabama St., Indianapolis, Indiana, to represent it in the Indiana territory south of the line drawn below Fort Wayne, and including Louisville, Kentucky.

Traylor Vibrating Screens and Conveyors Described

The Traylor Vibrator Company, Denver, Colorado, in a 24 page illustrated booklet describes the "Screen Supreme." This screen is made in three sizes, the T.R.7 for fine or coarse separation where large capacity is not necessary, the F.B.2 for the same class of work where capacity is essential, and the F.B.4 for heavy duty and large capacity. These screens weigh respectively 2,000, 2,500, and 5,000 pounds.

The screen has a heavy cast frame and is supported by four hanger rods containing vibration absorbing cushions which transmit very little of the vibration to the supports to which these rods are attached. Vibration absorbers supporting the screen from underneath can be substituted where conditions require. The screen cloth rests on arched supports which prevent whipping and resultant rapid wear. The screen is made in both single and double deck and can be equipped with dust proof steel enclosures.

The vibrating motion is produced by reciprocating motors built into the main frame of the screen, one on each side, consisting of a stator attached to the screen frame and an armature and bar attached to the screen sash. These motors alternately pull and release their armatures and are operated by a pulsating electric current obtained by adding a small amount of direct current from a d.c. generator to an alternating current of 110, 220, or 440 volts. A rheostat controls the amount of direct current added giving accurate control of vibration. The d.c. generator is part of the equipment and is enclosed in a metal cabinet. No bearings, cams, or pulleys are used in the operation of this screen so that no lubrication or adjustment is necessary. Water spilled on any part of the screen also has no effect on its operation.

The Traylor vibrator conveyor is also described in this booklet. It operates on the same principle as the screen and is built in capacities of 50 to 200 tons per hour, in widths of 20, 30, and 40 inches and in lengths ranging from 8 to 30 feet. The direction of vibration is at an angle to the conveyor, causing the material to move in that direction whether the conveyor be on a level, down-grade, or on a reasonably steep up-grade. It may also be used as a dewatering device. Both the screens and conveyor are designed especially for operation where floor space and head room are limited.

The Vibrote laboratory screen, a compact 50 pound screen for accurate testing use wherever 110 volt alternating current is available, is also described. The sieve platform is made in sizes for 8, 10 or 12 inch sieves and is so designed that no clamps are necessary to hold the screens to it. Three motions are produced, horizontal, vertical and rotary, and a snap switch produces two amplitudes of vibration. In this, as in the vibrator screen and conveyor, there are no wearing parts.

Cutler-Hammer Appoints New Chief Engineer

Appointment of N. L. Mortensen as chief engineer for the Cutler-Hammer Manufacturing Company of Milwaukee, effective September 1st, has been announced.

T. E. Barnum, former chief engineer, has been appointed consulting engineer for the company, in which position he will be able to give uninterrupted attention to engineering problems and outside engineering relations.

Mr. Mortensen has been connected with Cutler-Hammer for 21 years, the last 5 of which have been as assistant to Mr. Barnum. Articles by him have appeared frequently in the technical press and he has delivered numerous papers before electrical societies. He is a fellow of the A. I. E. E. and a member of the A. I. S. E. E.

Single Phase Motors

The General Electric Company announces an improved single-phase, repulsion induction motor, which in sizes including ¾, 1, 1½ and 2 horsepower at 1800 r. p. m., supplements the present line of SCR motors. It is of the constant speed, high starting torque type for general application. One of the most important improvements is the more efficient use of the stator punchings which is accomplished by taking full advantage of the design possibilities of the polar winding of a repulsion motor. Full advantage has been taken of sinusoidal distribution by designing a four pole motor, using a square punching with graded slot depths, so arranged that the deep slots are placed at the corners where the maximum core is available and the shallow slots placed in the flat portion of the punching. The motor is enclosed except for ventilating openings in the lower portion of each end shield. Air is drawn through the ventilating openings at the pulley end by means of an internal fan, passes around the stator laminations and out through the ventilating openings in the commutator end. It is designed to operate within a temperature rise of 40 deg. C. This materially broadens the field of application, permitting the use of a standard 40 degree motor in many cases where only a larger, closed motor would otherwise be chosen.

Baldwin Locomotives Described

The Baldwin Locomotive Works, Philadelphia, Pennsylvania, in Record No. 86 A illustrates and describes steam locomotives ranging from the lightest four-coupled tank locomotives for industrial and contractors' service to the heaviest types of railway locomotives with four and five pairs of coupled drive wheels. Most of these locomotives are built without truck wheels so that the entire weight is available for adhesion and maximum load in proportion to weight can be hauled.

Some of the locomotives are designed especially for certain classes of work such as: Light contractors' service where a narrow gauge track is used; steel works and blast furnace service in regular types and in models with strict limitations as to clearance for this and mine work; heavy yard and transfer service, with three or four pairs of coupled drive wheels and a separate tender.

Many other types are also illustrated ranging in size from a 2 inch gauge four coupled tank locomotive with a tractive force of 1,590 pounds and weighing 11,700 pounds, to a ten coupled standard gauge locomotive with a tractive force of 78,200 pounds and a total weight without tender of 320,000 pounds.

Several types of fireless steam storage locomotives are also described for switching and short haul use where fire risks must be absolutely eliminated. A number of internal combustion locomotives are also included in five standard sizes of 5, 7½, 10, 20 and 25 tons respectively. These all have positive drive and can be adapted to burn naphtha, alcohol, kerosene or distillates of 42 degrees Baume or higher, and having a flash point of not over 120 degrees F.

New Zelnicker Bulletin

Walter A. Zelnicker Supply Company of St. Louis, Missouri, is distributing a bulletin of new and used equipment that calls attention to the other 24 pages of information available. It includes the names of 134 customers, selected from a list of 25,000.

George E. Hall Dies Suddenly

George E. Hall, for the past 12 years president and general manager of the Boston Woven Hose and Rubber Company, died from heart trouble at Osterville, Massachusetts on Cape Cod, October 3. Mr. Hall was born in Brattleboro, Vermont, August 2, 1868, and was formerly connected with the International Paper Company of Watertown, New York. He joined the organization of the Boston Woven Hose and Rubber Company in 1907, being elected president of the organization in 1916. He continued actively in business almost to the day of his death.

Nordberg Company Absorbs Symons Brothers

The Symons Brothers Company of Chicago, Illinois, manufacturers of stone crushers, have been absorbed by the Nordberg Manufacturing Company of Milwaukee, Wisconsin. A $1,000,000 bond issue has been released to finance this consolidation which includes the transfer of valuable patents.

The entire Symons engineering sales and executive forces will be moved to the Nordberg main office in Milwaukee. The same representation engaged in selling and servicing the crushers will be retained and past policies will be continued.

Lidgerwood Makes Changes in Distributor Personnel

The Lidgerwood Manufacturing Company of Elizabeth, New Jersey, announces some recent appointments to its distribution personnel. Tide Water Supply Company of Norfolk, Virginia, with branch offices at Columbia, South Carolina, has been appointed sales agent. William Hamilton, Limited, of Petersborough, with branches in Montreal, Vancouver and New Glasgow, Nova Scotia, has been appointed Canadian distributor. It is represented in Manitoba by Kippy Kelly of Winnipeg.

A New Convertible Shovel

The Orton Crane and Shovel Company, Chicago, Illinois, recently brought out a new Model A convertible ⅝ yard shovel, which can be used as a shovel, crane, dragline, ditcher or skimmer. Attachments changing it from one to another of these can be installed in less than two hours.

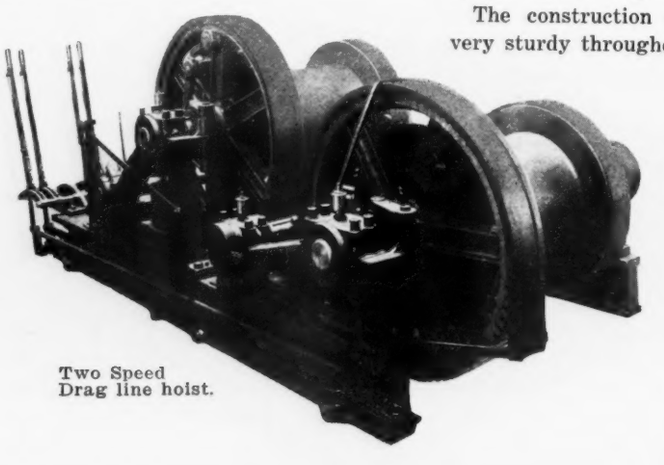
Alloy steel is used for all power shafts and gears and the base is built of rolled plates and shapes, riveted and electrically welded. The flexible crawling treads are the spring type and are self-cleaning. All bearings are interchangeable bronze bushings. Power is furnished by a heavy duty 53 h.p. motor with an electric starter as standard equipment.

The Model A equipped as a crane has a lifting capacity of 6 tons at a 12 foot radius and handles a ½ yard bucket with a 30 foot boom. The ditcher attachment has two drums mounted on the boom, one leading to the hoist drum and the other to the scoop, giving a straight direct pull. The dragline has a 30 foot lattice-type boom with a sliding fair-leader carried on a bronze-bushed cast-steel sheave and handles a ½ yard bucket. The skimmer has an effective length of travel of 11 feet and the scoop is 30 inches wide with a capacity of ½ cubic yard.

Bucket Elevators Discussed

The Jeffrey Manufacturing Company of Columbus, Ohio, is distributing its new illustrated bucket elevator catalog 465. It describes 184 bucket elevators of different styles or sizes, with capacities from 6½ to 750 tons per hour. The types of chains, buckets and casings used in these elevators are shown on 30 pages of drawings, and 22 photographers show the elevators performing the work for which they were designed.

The catalog lists 41 typical materials, giving their weight per cubic foot and recommending the type of elevator best suited to lift them. The catalog specifies steel castings in two forms, the riveted plate and angle and the spot welded flanged construction. A new feature described is the silent ratchet safety lock, that provides protection against spilling a loaded elevator when an unexpected interruption of power occurs, may be supplied with any bucket elevator.



Two Speed
Drag line hoist.

Thew Increases Sales Force

The Thew Shovel Company of Lorain, Ohio, announces that, due to a 62 per cent increase in sales of the Lorain-75, it has been necessary to add six new salesmen to its staff. J. H. Devine, formerly with the Smith Booth Usher Company, together with Malcolm Jones, will be located in the Chicago Office at 53 W. Jackson Boulevard; A. L. McLain, formerly with the White Motor Company, will be located at Dallas, Texas, with U. L. Wheeler, district manager; G. D. Laurell, formerly with the Nova Engine Company, will represent both the Thew Shovel Company and the Universal Crane Company in the Atlanta, Georgia, office. H. S. Beale will be located in the New York Office, and R. S. Delp in the Philadelphia Office.

In addition to the six salesmen, the following representatives have been appointed: The Southern Tractor Company of Montgomery, Alabama; the North Carolina Equipment Company, Raleigh, North Carolina; the Hall Perry Machinery Company, Butte, Montana; the Paragon Supplies of Vancouver, British Columbia; the Jennison Machinery Company, San Francisco, California; and the R. G. Moeller Company of Detroit, Michigan. These distributors and salesmen are fully equipped to render any desired service in the field.

Ottumwa Hoists Described

The Ottumwa Iron Works, Ottumwa, Iowa, is manufacturing a hoist which was recently developed. A feature of this hoist is the forward or pull-in drum which is equipped with a two-speed device operated by a hand lever while in motion, allowing the speed of the drum to be increased or reduced without stopping. The 75-100 h.p. hoist has 250 and 500 f.p.m. rope speeds on the 2-speed drum.

The construction of this hoist is very sturdy throughout, all gears are of steel, the clutches are lined with moulded asbestos metallic blocks and the brake bands are of asbestos. The design is such that all parts are in proportion to withstand severe usage.

The Shaw Classifier

By C. S. Huntington

The Shaw classifier, an improved device for classifying and cleaning sand, is the development of four years of experimentation and operation in connection with the most difficult of sand classifying and cleaning operations.

The machine was developed to clean and grade sand with a more accurate sizing than can be done in existing machines. There has been a period of about four years of experimentation in the operation of the classifiers, and there are about twenty machines in use.

The Shaw classifier can be used as a single separator where the sand is to be separated from dirty water, or it can be used as a classifier, making one or more grades of sand, depending upon the number of machines used.

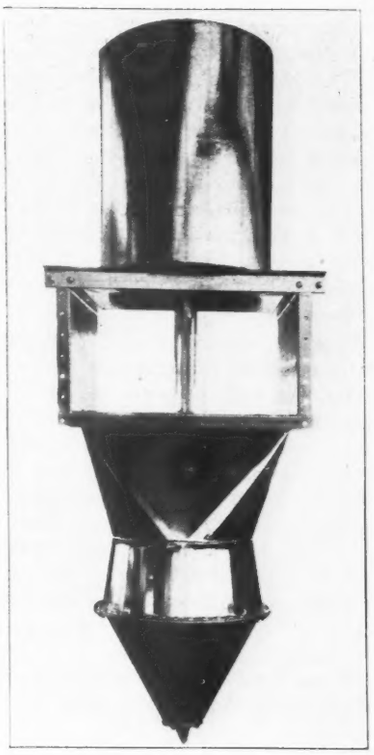
It will produce a drier sand than any of the automatic settling tanks now on the market, but not as dry as that produced by the screw dewatering conveyor or the dewatering flight conveyor. It will give a cleaner product than any of these. The Shaw classifier is a combination of a surface current classifier and a rising current classifier.

Water, sand, dirt and other foreign matter from the washing screens flow down a slightly inclined flume which is extended horizontally through the Shaw classifier at the rectangular portion shown in the illustration. In the bottom of the classifier portion of this flume is a rectangular opening, through which sand settles into the conical tank or separating chamber below, just as in any sand separator.

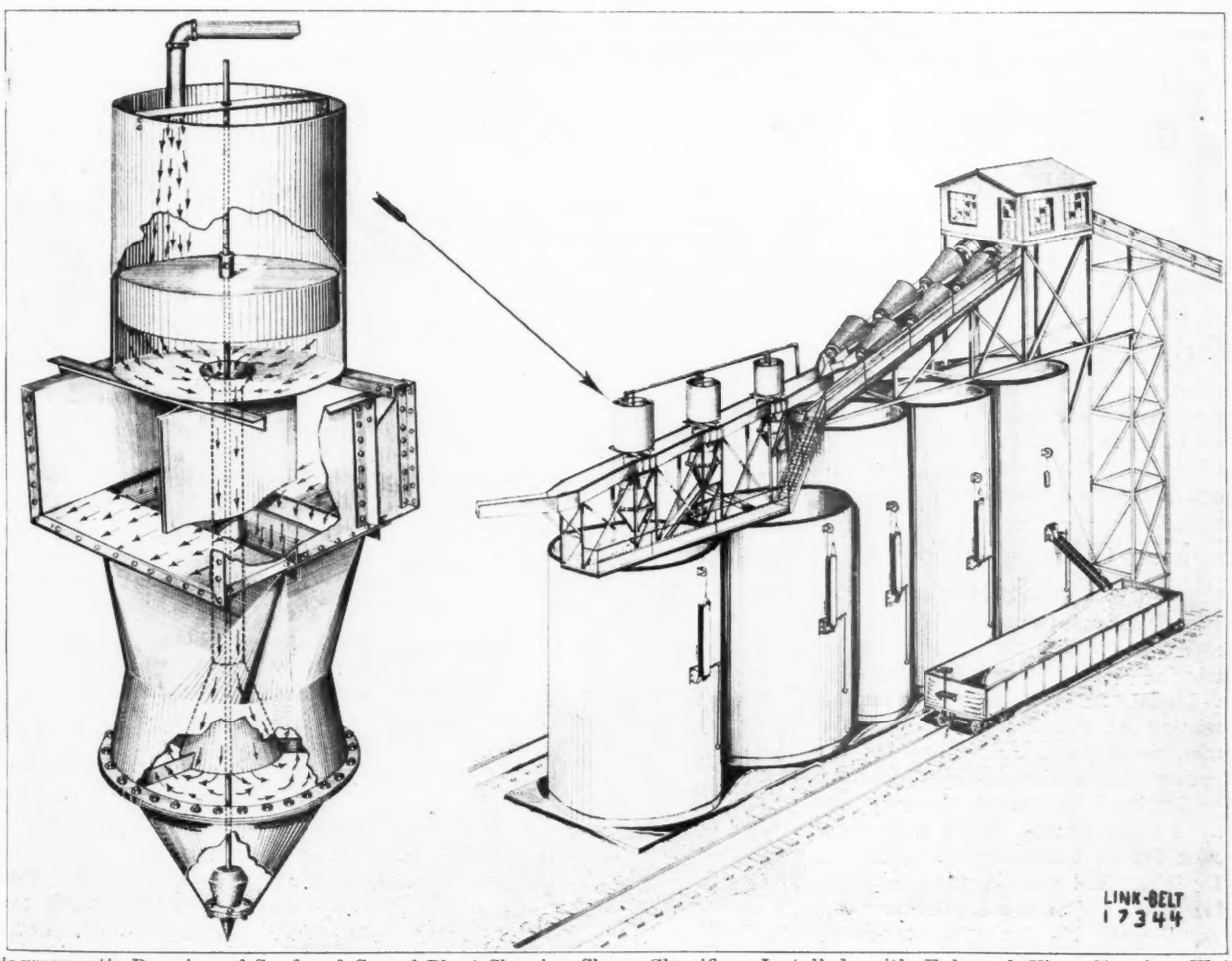
Above the flume is mounted a "hydraulic water" tank, which receives a supply of fresh water through a pipe entering at the top. The quantity of fresh water, or "hydraulic water," delivered into the tank, can be regulated by a hand valve in the pipe, to suit the work to be done.

A larger "hydraulic water" pipe leads directly down from the center of the tank, through the flume and into the separating chamber, where the lower end of the pipe is flared out like an inverted funnel.

Inside of the "hydraulic water" tank is a float to which is fastened a vertical rod extending down through the pipe to the discharge opening at the bottom of classifier, where a rubber tipped valve on the end of the rod regulates the discharge, by reason



Shaw Sand Classifier



Diagrammatic Drawing of Sand and Gravel Plant Showing Shaw Classifiers Installed, with Enlarged View Showing Water Currents. August, 1928

of the raised or lowered position of the float.

The pressure of the "hydraulic water" as it spreads out around the flared edges of the central pipe in the separating chamber, is sufficient to produce a gentle upward current, lifting out any dirt, silt, leaves, sticks or other foreign particles, and sometimes some of the finer grains of sand; while the larger heavier grains settle in the bottom of the cone.

When the accumulation of sand partially stops up the entrance of fresh water, the back pressure in the float tank lifts the float, which in turn draws up the rod and its bottom valve, allowing accumulated sand to flow out until the fresh water can enter again and restore the former operations of separation. Practically, the regulation is often sufficiently perfect to produce a continuous flow of sand, in small or large quantities, depending on the feed.

Where it is desired to make a separation in the sizes of grains of sand, two or more classifiers are used in series, with the first regulated to take out only the heavier grains, and the currents adjusted in the following classifiers to the sizes of grains desired.

The Shaw classifier is patented, and is manufactured under license by the Link-Belt Company of Chicago and Philadelphia.

Van Dorn Sales Organization Changed

The Van Dorn Electric Tool Company of Cleveland, Ohio, recently announced the following changes in their sales organization: E. J. Phillips who had the Detroit territory has been transferred to San Francisco and his place will be filled by his brother, George Phillips. J. F. Spaulding has been transferred to the Baltimore territory to fill the vacancy resulting from the transfer of Jack Beggs to the main office in Cleveland.

Trackson Company Appoints New Distributors

The Trackson Company, Milwaukee, Wisconsin, recently appointed a number of new distributors for Trackson - McCormick - Deering equipment, consisting of full-crawlers, loaders, cranes, shovels, etc. Those now distributing this equipment are: The New England Implement Company, Inc., 19 Jersey Street, Boston, and 22 Garden Street, Worcester, Massachusetts; Wm. Ford and Company, Inc., 15841 Second Boulevard, Highland Park, Detroit, Michigan; Industrial Power Company, 2618 Fond du Lac Avenue, Milwaukee, Wisconsin; Industrial Tractor Sales Company, Inc., 180 N. Michigan Avenue, Chicago, Illinois; and Hooper Equipment Company, 523-27 E. Washington Street, Indianapolis, Indiana.

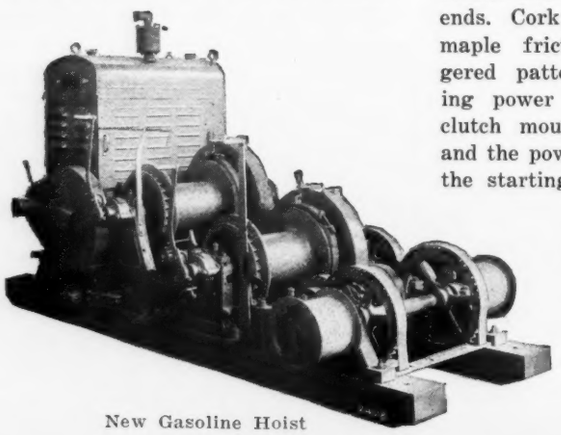
H. E. Chilcoat

Koppel Car Appoints Sales Manager

According to an announcement of the Koppel Industrial Car and Equipment Company of Pittsburgh, Penna., H. E. Chilcoat has been appointed manager of sales for the air dump car division as of October 1. Mr. Chilcoat served considerable time with the Clark Car Company and for the past two and one-half years has been engaged in consulting commercial engineering work from which he went to join the Koppel Company.

An Illustrated Bucket Folder

The Blaw-Knox Company of Pittsburgh, Penna., is distributing a 16 page folder that illustrates 8 different types of buckets and calls attention to their different designs, sizes, construction, and uses. It is pointed out that ball bearing sheaves, an exclusive feature of dreadnaught buckets, not only increase the digging power, but also entirely eliminate sheave bearing trouble. The principal object of the folder is to act as a reminder and call attention to bulletin 1050 which, it is said, is fully illustrative and descriptive of these buckets.



New Gasoline Hoist

Plow Scraper Described

The Garst Manufacturing Company is distributing a folder describing the Garst Power Plow scraper. This scraper utilizes the principles of the plow and is essentially a right and left hand plow joined at the rear and having a vertical cover plate. The plowshare front ends are removable so that different shapes can be used for different soils. The design is such that the scraper naturally digs in until it is loaded and then rides on the surface. No teeth are necessary except in the very hardest materials.

These scrapers have a normal operating radius of 300 to 400 feet which can be augmented by special equipment and are made in all sizes from 1/3 to 6 yards. They are as efficient under water as in dry material and the lid prevents the gravel from washing out. The adjustable top also permits the increase or decrease of production as required and can be raised to compensate for the wear on the cutting edges.

A New Gasoline Hoist

In order to increase the range of its multipurpose gasoline hoists, the Lidgerwood Manufacturing Company of Elizabeth, New Jersey, has designed and is building a super-utility 40 h.p. hoist. With this addition, the utility line of gasoline hoists includes sizes to handle all classes of general construction hoisting from 2,500 pounds at 150 feet per minute to the 4,000 line pull of the new hoist.

This hoist is built with a single drum, but a second drum is available for installation either in the factory or in the field, as required. The drums, 12 inches in diameter, of 20 inch face and 24 inch flanges, hold 800 feet of ⅝ inch rope. They are fitted with non-burn lined hand brakes over the friction at the gear ends. Cork inserts, pressed into the maple friction blocks in a staggered pattern, increased the holding power of the blocks. A disc clutch mounted between the motor and the power take off shaft, permits the starting of the motor under no load. It is equipped with a 40 h. p. 4½ by 6¼ inch four cylinder gasoline motor that supplies ample power for derrick work, making the application of a swinging gear unit practical.